Davad Investments Inc.
1131A Leslie St., Ste. 500
Toronto, ON M3C 3L8

File No. (Rev 1) 24-076
December 18, 2024

Attention: Benjamin Hung

Subject: HYDROGEOLOGICAL REVIEW REPORT
45 Grenoble Drive, Toronto, Ontario

Grounded Engineering Inc. ("Grounded") is pleased to provide you with this Hydrogeological Review for the site known as 45 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
- Hydrogeological Review Report

As part of the development applications process, the City of Toronto requires that both 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.

Andrew Kernerman, B.A.Sc., EIT.
Project Coordinator

Michael Diez de Aux, M.A.Sc., P.Geo., P.Eng.
Associate

FOUNDATION DRAINAGE SUMMARY FORM

General Information
Applicant Name: Davad Investments Inc.
Development Address: 45 Grenoble Drive, Toronto, ON
Development Application #: TBD
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]: 12
Monitoring Months: □ Jan □ Feb □ Mar □ Apr □ May ■ Jun ■ Jul ■ Aug □ Sept □ Oct □ Nov □ Dec
# of Measurements: 6
Peak Observed GWL [masl]: 121.4
Estimated Maximum Anticipated GWL [masl]: 124.5
Lowest Elevation of Proposed Structure [masl]: 116.7
Proposed Condition and Measures *(Complete all)*
On-site Management Provided? ■ Yes (Describe) □ No (Provide Rationale) Watertight basement
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: Mike Diez de Aux Designation: P.Eng.
Signature: Date: Dec 18, 2024

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

November 1, 2021

TORONTO

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 to TW, EM&P	

IF ANY OF THE REQUIREMENTS LISTED BELOW HAVE NOT BEEN INLCUDED 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	45 Grenoble Drive, Toronto, Ontario	1 (Sec 1)	
Postal Code	M3C 1C4	1 (Sec 1)	
Property Owner (on request for comments memo)	Davad Investments Inc.	1 (Sec 1)	
Proposed description of the project (if applicable) (point towers, number of podiums)	One high-rise tower added to existing development with three underground parking levels.	1 (Sec 1)	
Land Use (ex. commercial, residential, mixed, institutional, industrial)	Proposed: Residential	1 (Sec 1)	
Number of below grade levels for the proposed structure	3	1 (Sec 1)	
HYDROLOGICAL REVIEW INFORMATION			
Date Hydrological Review was prepared:	2024-12-18	Title	
Who Performed the Hydrological Review (Consulting Firm)	Grounded Engineering Inc.	1 (Sec 1)	
Name of Author of Hydrological Review	Michael Diez de Aux, M.A.Sc., P.Geo., P.Eng.	1 (Sec 1)	

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**	**Soldier Pile and Lagging Shoring Scenario** - Groundwater: 95,000 - Rainfall: 57,000 - Total: 152,000 - SF: 3.0 **Cut-Off Wall Shoring Scenario** - Groundwater: 5,000 - Rainfall: 57,000 - Total: 62,000 - SF: 3.0 (All Volumes in L/day)	9 (Sec 10)	

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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**	**Soldier Pile and Lagging Shoring Scenario** - Groundwater: 30,826 - Rainfall: 57,000 - Total: 87,826 **Cut-Off Wall Shoring Scenario** - Groundwater: 156 - Rainfall: 57,000 - Total: 57,156 (All Volumes in L/day)	Appendix F	
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	Fully Watertight structure – 0 L/day What factor of safety was used? 3.0	9 (Sec 10)	
List the nearest surface water (river, creek, lake)	The nearest waterbody is Don River located approximately 400 m east of the property.	3 (Sec 3)	
Lowest basement elevation	119.2 masl – Finished Floor Elevation	1 (Sec 1)	
Foundation elevation	117.2 masl – Base of Footings (Raft)	1 (Sec 1)	
Ground elevation	127.7 masl	Appendix F	

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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), Figures 3 & 4 Appendix A	
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	4 (Sec 4), Appendix A	

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	4 (Sec 4), Appendix A	
A table of geology/soil stratigraphy for the property has been included.	✓ Yes	3 (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 (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.	⊗ No A pumping test was not conducted.	5 (Sec 5.1)	
The pump test been carried out for at least 24 hours if possible. If not, has a slug test been conducted?	⊗ No A pumping test was not conducted. Slug tests were conducted.	5 (Sec 5.2)	

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 digital water level meter. The frequency of the measurements was biweekly for a 3 month period.	4 (Sec 4)	
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	4 (Sec 4), 5 (Sec 5.2)	N/A
The above noted slug or pump tests have been included in the report.	✓ Yes	5 (Sec 5.2), 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	7 (Sec 7), Appendix E	

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. 12-14 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.**	Sanitary Combined Sewer: • All samples met the criteria	7 (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 69 mg/L; Limit 15 mg/L; RDL 2 mg/L) • Total Manganese (Result 0.31 mg/L; Limit 0.05 mg/L; RDL 0.00001 mg/L) • Detection Limit Exceedance: Total PAHs (Result <0.005 mg/L; Limit 0.002 mg/L; RDL 0.005 mg/L) See section 7.0 of Hydrogeological report for further discussion on PAH exceedance.	7 (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	

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
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	Appendix E	
List any of the sample parameters that exceed the Bylaw limits with the reporting detection limit (RDL) included.	Sanitary Combined Sewer: • All parameters met the limits Storm Sewer: • Total Suspended Solids (Result 169mg/L; Limit 15 mg/L; RDL 2 mg/L) • Total Manganese (Result 0.31 mg/L; Limit 0.05 mg/L; RDL 0.00001 mg/L) • Detection Limit Exceedance: Total PAHs (Result <0.005 mg/L; Limit 0.002 mg/L; RDL 0.005 mg/L) See section 7.0 of Hydrogeological report for further discussion on PAH exceedance.	7 (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)? Does the associated Geotechnical report recommend a back-up system or relief safety valve(s)?	✓ Yes ✓ Yes	8 (Sec 9) 16 (Sec 3.5) of Geotech Report	

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
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	11-13 (Sec 11)	N/A
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	11-13 (Sec 11-12)	N/A

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

Appendix A:

SANITARY/COMBINED **Sample Location: BH102-I**

Inorganics		Sample Result (mg/L)	Sample Result with upper RDL included (mg/L)	
Parameter	mg/L			ug/L
BOD	300	<2	2	300,000
Fluoride	10	0.12	0.10	10,000
TKN	100	0.92	0.20	100,000
pH	6.0 - 11.5	7.62		6.0 - 11.5
Phenolics 4AAP	1	<0.0010	0.0010	1,000
TSS	350	**69**	10	350,000
Total Cyanide	2	<0.0050	0.0050	2,000
Metals				
Chromium Hexavalent	2	<0.00050	0.00050	2,000
Mercury	0.01	<0.00010	0.00010	10
Total Aluminum	50	1.3	0.025	50,000
Total Antimony	5	<0.00050	0.00050	5,000
Total Arsenic	1	<0.0010	0.0010	1,000
Total Cadmium	0.7	0.00019	0.000090	700
Total Chromium	4	<0.0050	0.0050	4,000
Total Cobalt	5	0.0020	0.00050	5,000
Total Copper	2	0.0049	0.00090	2,000
Total Lead	1	0.0014	0.00050	1,000
Total Manganese	5	**0.31**	0.0020	5,000
Total Molybdenum	5	0.0017	0.00050	5,000
Total Nickel	2	0.0035	0.0010	2,000
Total Phosphorus	10	<0.10	0.10	10,000
Total Selenium	1	<0.0020	0.0020	1,000
Total Silver	5	<0.000090	0.000090	5,000
Total Tin	5	0.0026	0.0010	5,000
Total Titanium	5	0.069	0.0050	5,000
Total Zinc	2	0.022	0.0050	2,000
Petroleum Hydrocarbons				
Animal/Vegetable Oil & Grease	150	<0.50	0.50	150,000
Mineral/Synthetic Oil & Grease	15	1.2	0.50	15,000

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Volatile Organics		Sample Result (mg/L)	Sample Result with upper RDL included (mg/L)	
Parameter	mg/L			ug/L
Benzene	0.01	<0.00020	0.00020	10
Chloroform	0.04	<0.00020	0.00020	40
1,2-Dichlorobenzene	0.05	<0.00040	0.00040	50
1,4-Dichlorobenzene	0.08	<0.00040	0.00040	80
Cis-1,2-Dichloroethylene	4	<0.00050	0.00050	4,000
Trans-1,3-Dichloropropylene	0.14	<0.00040	0.00040	140
Ethyl Benzene	0.16	<0.00020	0.00020	160
Methylene Chloride	2	<0.0020	0.0020	2,000
1,1,2,2-Tetrachloroethane	1.4	<0.00040	0.00040	1,400
Tetrachloroethylene	1	<0.00020	0.00020	1,000
Toluene	0.016	<0.00020	0.00020	16
Trichloroethylene	0.4	<0.00020	0.00020	400
Total Xylenes	1.4	<0.00020	0.00020	1,400
Semi-Volatile **Organics**				
Di-n-butyl Phthalate	0.08	<0.008	0.008	80
Bis (2-ethylhexyl) Phthalate	0.012	<0.008	0.008	12
3,3'-Dichlorobenzidine	0.002	<0.0008	0.0008	2
Pentachlorophenol	0.005	<0.002	0.002	5
Total PAHs	0.005	**<0.005 (1)**	0.005	5
Misc **Parameters**				
Nonylphenols	0.02		(0.001)	20
Nonylphenol Ethoxylates	0.2		(0.01)	200

Sample Collected: June 14, 2024

Temperature: 15.3 °C

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HYDROLOGICAL REVIEW SUMMARY

STORM **Sample Location: BH102-I**

Inorganics		Sample Result (mg/L)	Sample Result with upper RDL included (mg/L)	
Parameter	mg/L			ug/L
pH	6.0 - 9.5	7.62	7.62 (0.05)	
BOD	15	<2	(2)	15,000
Phenolics 4AAP	0.008	<0.0010	0.0010	8
TSS	15	**69**	10	15,000
Total Cyanide	0.02	<0.0050	0.0050	20
Metals				
Total Arsenic	0.02	<0.0010	0.0010	20
Total Cadmium	0.008	0.00019	0.000090	8
Total Chromium	0.08	<0.0050	0.0050	80
Chromium Hexavalent	0.04	<0.00050	0.00050	40
Total Copper	0.04	0.0049	0.00090	40
Total Lead	0.12	0.0014	0.00050	120
Total Manganese	0.05	**0.31**	0.0020	50
Total Mercury	0.0004	<0.00010	0.00010	0.4
Total Nickel	0.08	0.0035	0.0010	80
Total Phosphorus	0.4	<0.10	0.10	400
Total Selenium	0.02	<0.0020	0.0020	20
Total Silver	0.12	<0.000090	0.000090	120
Total Zinc	0.04	0.022	0.0050	40
Microbiology				
E.coli	200	<10	10	200,000
Volatile Organics				
Parameter	mg/L			ug/L
Benzene	0.002	<0.00020	0.00020	2
Chloroform	0.002	<0.00020	0.00020	2
1,2-Dichlorobenzene	0.0056	<0.00040	0.00040	6
1,4-Dichlorobenzene	0.0068	<0.00040	0.00040	7
Cis-1,2-Dichloroethylene	0.0056	<0.00050	0.00050	6
Trans-1,3-Dichloropropylene	0.0056	<0.00040	0.00040	6
Ethyl Benzene	0.002	<0.00020	0.00020	2
Methylene Chloride	0.0052	<0.0020	0.0020	5
1,1,2,2-Tetrachloroethane	0.017	<0.00040	0.00040	17
Tetrachloroethylene	0.0044	<0.00020	0.00020	4
Toluene	0.002	<0.00020	0.00020	2
Trichloroethylene	0.0076	<0.00020	0.00020	8
Total Xylenes	0.0044	<0.00020	0.00020	4

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HYDROLOGICAL REVIEW SUMMARY

Semi-Volatile Organics		Sample Result (mg/L)	Sample Result with upper RDL included (mg/L)	
Di-n-butyl Phthalate	0.015	<0.008	0.008	5
Bis (2-ethylhexyl) Phthalate	0.0088	<0.008	0.008	8.8
3,3'-Dichlorobenzidine	0.0008	<0.0008	0.0008	0.8
Pentachlorophenol	0.002	<0.002	0.002	2
Total PAHs	0.002	**<0.005 (1)**	0.005	2
PCBs	0.0004	<0.00005	0.00005	0.4
Misc Parameters				
Nonylphenols	0.001	<0.001	(0.001)	1
Nonylphenol Ethoxylates	0.01	<0.005	(0.005)	10

Sample Collected: June 14, 2024

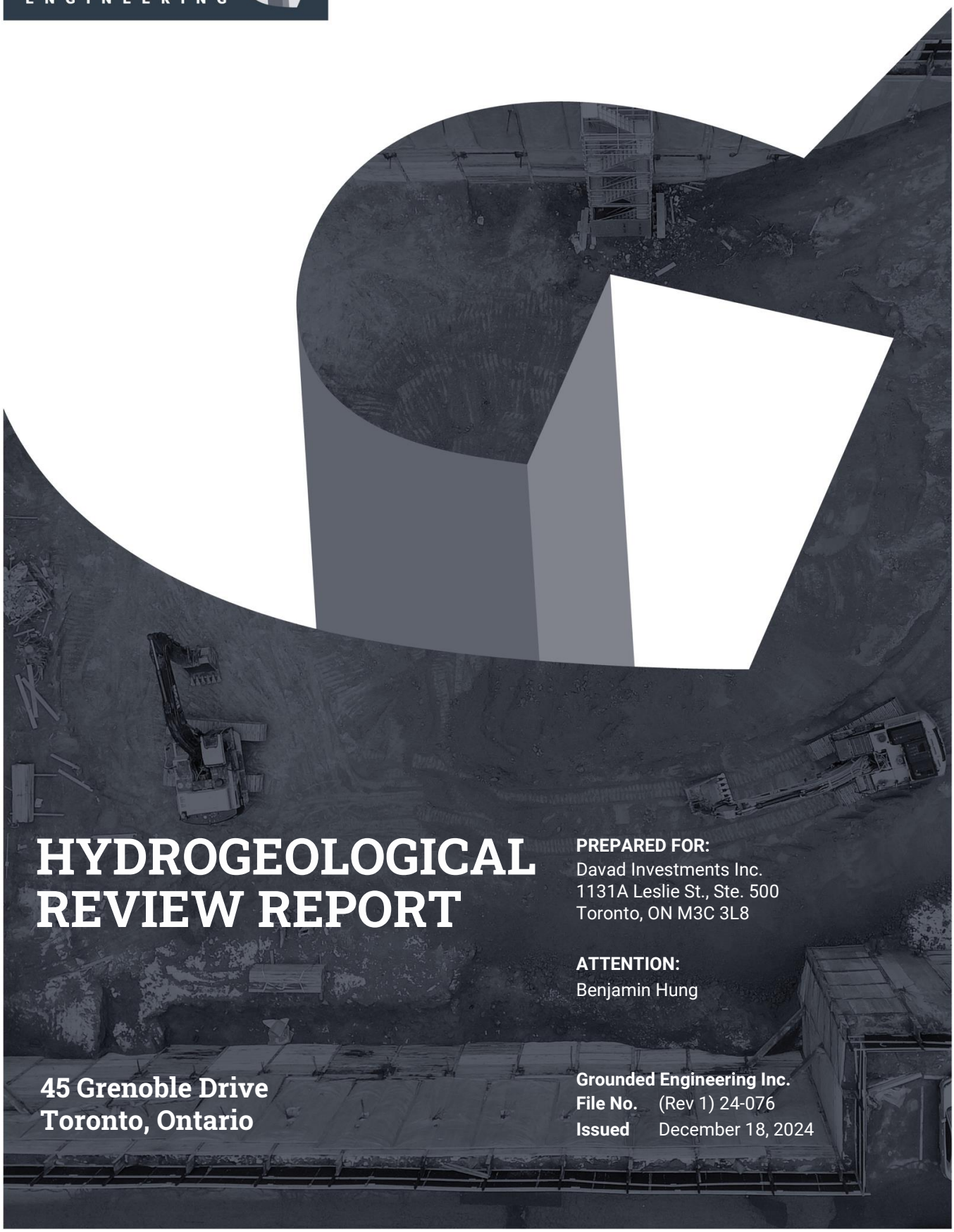
Temperature: 15.3 °C

Consulting Firm that prepared Hydrological Report: Grounded Engineering Inc.

Qualified Professional who completed the report summary: Michael Diez de Aux, M.A.Sc., P.Geo., P.Eng.
Print Name

Qualified Professional who completed the report summary: _____
Signature

Date & Stamp



HYDROGEOLOGICAL REVIEW REPORT

PREPARED FOR:
Davad Investments Inc.
1131A Leslie St., Ste. 500
Toronto, ON M3C 3L8

ATTENTION:
Benjamin Hung

45 Grenoble Drive
Toronto, Ontario

Grounded Engineering Inc.
File No. (Rev 1) 24-076
Issued December 18, 2024

1 Banigan Drive, Toronto ON M4H 1G3 | (647) 264-7909 | groundedeng.ca | Grounded Engineering

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FIGURES

APPENDICES

1 Introduction

Davad Investments Inc. has retained Grounded Engineering Inc. to provide hydrogeological engineering design advice for their proposed development at 45 Grenoble Drive, in Toronto, Ontario.

Revision 1 of this report includes updated architectural drawings.

Grounded has been provided with the following reports and drawings to assist in our scope of work:

- Site survey, prepared by JD Barnes (Mar 20, 2023).
- Architectural Drawings, "45 Grenoble Drive, Toronto, Ontario"; Project 23009, dated November 26, 2024 (Issued for zoning by-law amendment), prepared by BDP Quadrangle Limited.

Property Information	
Location of Site	45 Grenoble Drive, Toronto, Ontario, M3C 1C4
Ownership of Site	Davool Investments Inc.
Site Dimensions (m)	108 m x 89 m
Site Area (m^2)	9612 m^2

Proposed Development	
Number of Building Structures	1
Number of Underground Levels	3
Lowest Finished Floor Elevation (FFE)	Depth 8.5 m / Elev. 119.21 masl
Approx. Base of Foundations*	Raft - Depth 10.5 m / Elev. 117.21 masl
Sub-Grade Area (m^2)	2275 m^2
Land Use Classification	Residential

Qualified Person and Hydrogeological Review Information	
Qualified Person	Michael Diez de Aux, M.A.Sc., P.Geo., P.Eng.
Consulting Firm	Grounded Engineering Inc.
Date of Hydrogeological Review	December 18, 2024

Qualified Person and Hydrogeological Review Information	
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 4 boreholes to a maximum depth of 9.4 m, which were instrumented with 7 monitoring wells. ▪ The level of study presented in this report is consistent with the requirements for a Zoning Bylaw Amendment, Plan of Subdivision, Consent to Server, or Site Plan Control application. Additional boreholes, wells, in-situ testing, and a detailed hydrogeological engineering report will be required for detailed design and building permit purposes. ▪ Completion of slug tests in 4 available monitoring wells. Borehole 101-S and Borehole 102-S were dry. ▪ Groundwater elevation monitoring for three (3) months on a bi-weekly basis ▪ 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	
Site Topography	The site has an approximate ground surface elevation of 127.7 masl.
Local Physiographic Features	The site is composed of sand, clayey silt till and silt and clay deposits.
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.
Watershed	The site is located within the Don River Watershed. Locally, groundwater is anticipated to flow west to southwest towards the Don River West Branch located 360 m west of the site.
Surface Drainage	Surface water is expected to flow towards private and municipal catch basins located on or adjacent to the site, via the on-site paved parking areas, Grenoble Drive to the North and East.

2 Study Area Map

A map has been enclosed which shows the following information:

- All monitoring wells identified on site, and within the study area

- All boreholes identified on site
- All buildings identified on site and within the study area
- The site boundaries
- 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 is outlined as follows:

Site Stratigraphy				
Stratum/Formation	**Depth Range (mbgs)**	**Elevation Range (masl)**	**Hydraulic Conductivity (m/s)**	**Method of Determination**
Fill	0 – 2.2	127.7 – 125.5	1.0×10^{-6}	literature[1]
Uppers Sands	2.2- 8.5	125.5 – 119.2	1.0×10^{-5}	literature/grain size
Glacial Till	8.5 – 18.7	119.2 – 109.1	1.0×10^{-9}	slug test

Surface Water			
Surface Water Body	**Distance from site (m)**	**Direction from site**	**Hydraulically Connected to Site (yes/no)**
Don River	400	East	No

4 Groundwater Elevations

4.1 Monitoring Well Information

Well ID	Well Diameter (mm)	Ground Surface (masl)	Top of Screen (masl)	Bottom of Screen (masl)	Screened Geological Unit
BH101-S	50	128.1	125.0	122	Sand
BH101-D	50	128.1	115.9	112.9	Glacial Till
BH102-S	50	127.8	124.8	121.7	Sand

[1] Freeze and Cherry (1979)

Well ID	Well Diameter (mm)	Ground Surface (masl)	Top of Screen (masl)	Bottom of Screen (masl)	Screened Geological Unit
BH102-I	50	127.8	120.2	117.1	Sand / Silts and Clays
BH102-D	50	127.8	112.6	109.5	Silts and Clays
BH103	50	122.2	116.1	113.0	Silts and Clays
BH104	50	122.1	116.0	113.0	Silts and Clays

4.2 Well Observations

A detailed table of monitoring well observation data is appended.

For design purposes, the groundwater table is at Elev. 121.4 m. The groundwater table is present in all soil units. When penetrated the sands unit will yield free flowing water. The cohesive silty unit has a low permeability and will yield minor seepage in the short-term when penetrated.

Based on the measured groundwater elevations in the lower clay, the anticipated groundwater flow direction at this site is presently to the north. However, this may change as the wells continue to stabilize.

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.

4.3 Maximum Anticipated Groundwater Level (MAGWL)

Per the City of Toronto, Toronto Water Infrastructure Management's Foundation Drainage Policy (November 1, 2021), long term connection to and discharge of foundation drainage to the City's sanitary sewer system will not be permitted. A connection to the City's storm sewer system may be granted if all conditions of Section 4.2 and 4.3 of the policy are satisfied, including that the lowest elevation of any proposed structure is higher than the Maximum Anticipated Groundwater Level (MAGWL) at the site.

The MAGWL is determined based on the following equation:

Maximum Anticipated GWL = Peak Static GWL Observed + Fluctuation Allowance

The fluctuation allowance can be determined by one of the following monitoring methods:

- **Option 1 (Flexible, Year Round):** Capture a minimum of three (3) static groundwater level measurements, taken every two weeks, within any period of the calendar year (the City's ToR for development applications also governs, which requires six (6) biweekly measurements instead of three.) Using Option 1 monitoring, the Fluctuation Allowance is selected from the following table:

Month of Observed Peak Static GWL	Fluctuation Allowance [m]
January	1.9
February	2.1
March	1.9
April	1.6
May	1.3
June	1.9
July	3.1
August	2.4
September	2.6
October	2.8
November	2.3
December	2.4

- **Option 2 (Peak Season):** Capture a minimum of six (6) static groundwater level measurements, taken every two weeks, within the months of April, May, and June. Using Option 2 monitoring, the Fluctuation Allowance is 0.8 m.

The MAGWL calculation is summarized as follows:

Groundwater Elevation	
Design Groundwater Elevation (masl)	**121.4**
MAGWL Assessment Option	Option 1
Seasonal Fluctuation (m)	3.1
Maximum Anticipated Groundwater Level (masl)	124.5
Base of Subfloor Drainage Layer (masl)	116.7
Higher or lower than MAGWL	Lower than MAGWL

As the proposed structure (taken as the base of subfloor drainage layer) extends below the determined MAGWL, long term discharge of groundwater to the City's sewer systems is unlikely to be permitted. Either the on-site management of groundwater, or a fully waterproofed basement, is implied.

5 Aquifer Testing

5.1 Pumping Test

A pumping test was not attempted at the site. Slug tests were conducted and are presented in the section below.

5.2 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)
BH102-I	120.2 – 117.1	Silts and Clays/Sands	4.44×10^{-7}
BH102-D	112.6 – 109.5	Silts and Clays	3.58×10^{-8}
BH103	116.1 – 113.0	Silts and Clays	4.50×10^{-9}
BH104	116.0 – 113.0	Silts and Clays	6.40×10^{-9}

5.3 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)
BH101-SS6	Sand	Alyamani and Sen, Barr, Beyer, Sauerbrei, Kruger, Zamarin, Krumbein and Monk	2.5×10^{-5}
BH101-SS12	Silt and Clay	Barr, Sauerbrei, Alyamani and Sen	7.5×10^{-10}

Sample ID	Soil Description	Applicable Analysis Methods	Hydraulic Conductivity (m/s)
BH102-SS7	Sand	Beyer, Sauerbrei, Alyamani and Sen, Barr, USBR, Krumbein and Monk	4.7×10^{-5}
BH102-SS15	Silt and Clay	Alyamani and Sen, Barr, Sauerbrei	4.2×10^{-10}
BH103-SS6	Clayey Silt Till	Alyamani and Sen, Barr, Sauerbrei	1.8×10^{-8}
BH104-SS7	Clayey Silt Till	Alyamani and Sen, Barr, Sauerbrei	6.5×10^{-10}

The results of the analyses are presented in Appendix D.

5.4 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}
Sands	10^{-2} to 10^{-7}
Glacial Tills	10^{-6} to 10^{-12}
Silts and Clays	10^{-9} to 10^{-12}

6 Sump Monitoring

A new basement structure is proposed for the site. The monitoring of the existing sumps (where present) is excluded from the present scope.

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 BH102-I on June 6, 2024. 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 69 mg/L)
- Total Manganese (Limit 0.05 mg/L, Result 0.31 mg/L)
- Detection Limit Exceedance: Total PAHs (Limit 0.002 mg/L, Result <0.005 mg/L)

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

A detection limit exceedance was flagged for Total PAHs. This is rare and not expected to occur in future groundwater sampling. For the purposes of this report, it is considered an anomaly.

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

For design purposes, the stabilized groundwater table is at Elev. 121.4± m. The groundwater table is present in all the native soil units. The lowest (P3) FFE is at about Elev. 119.2 m. Bulk and foundation excavations will extend below the design groundwater table.

The proposed shoring methodology at the site is currently undetermined. For the purposes of this report, the following numerical analyses were conducted with respect to dewatering volumes and groundwater seepage at the site:

- Conventional soldier piling and lagging;
- Continuous interlocking caissons; and
- Fully watertight structure

To better control groundwater seepage during construction, the proposed shoring at the site may consist of a continuous interlocking full caisson wall. The shoring cut-off wall approach would provide a fully continuous temporary groundwater cut-off barrier (i.e. piles and fillers), which will enable the site to be dewatered during construction without inducing more flow into the excavation. Dewatering inside an excavation protected by a cut-off barrier wall may be conducted using conventional sump arrangements.

The City of Toronto no longer allows long-term groundwater drainage into their sewer system, which implies that basement structures must be made fully watertight. The proposed building may therefore be supported by a raft foundation, with watertight foundation walls designed to withstand hydrostatic forces (lateral and uplift).

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.

A professional dewatering contractor must 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 underground structure will need to be fully waterproofed at this site, per the discussion in Sections 4 and 10.

9 Private Water Drainage System (PWDS)

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 F.

The groundwater seepage estimates provided below represent the steady state groundwater seepage. There will also 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 has been provided below, which will require removal before steady state is reached. A caisson cutoff wall is also an option to reduce flows. Transient groundwater flow will be limited to the stored groundwater volume within the extent of excavation (plus some seepage through the wall).

If the excavation is exposed to the elements, stormwater 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 stormwater from a 100-year storm. The additional volume that will be generated in the occurrence of a 100-year storm event is approximately 214,000 L.

The following design considerations and values have been incorporated into the numerical modelling / dewatering estimates:

- Short term (construction) dewatering assumes a caisson wall hydraulic conductivity of 10^{-9} m/s. The caisson wall option assumes a continuous interlocking caisson wall to act as a lateral groundwater barrier.
- In the long term, the basement is assumed to be a fully watertight structure. There will be no long term water takings or discharge.
- A Factor of Safety of 3.0 was used for all groundwater seepage volume calculations.

The design hydraulic conductivities for the site are:

Design Hydraulic Conductivity	
Stratum/Formation	**K (m/s)**
Earth Fill	1.0×10^{-6}
Upper Sands	1.0×10^{-5}
Silts and Clay	1.0×10^{-9}

Stored Groundwater (pre-excavation/dewatering)					
Volume of Excavation (m^3)	**Volume of Excavation Below Water Table (m^3)**	**Estimated Volume of Stored Groundwater**		**Estimated Volume of Available Groundwater**	
		m^3	**L**	**m^3**	**L**
23,888	9,305	4,900	4,900,000	1,200	1,200,00

The quantity estimates for both short- and long-term conditions are presented below and in the appendices.

Short Term (Construction) Steady State Groundwater Quantity						
Scenario	**Estimated Groundwater Seepage**		**Design Rainfall Event (25mm)**		**Estimated Total Daily Water Takings**	
	L/day	**L/min**	**L/day**	**L/min**	**L/day**	**L/min**
Soldier Pile & Lagging	95,000	66.0	57,000	39.6	152,000	105.6
Full Caisson Wall	5,000	3.5	57,000	39.6	62,000	43.1

Long Term (Permanent) Steady State Groundwater Quantity - Fully Watertight					
Estimated Groundwater Seepage		**Estimated Infiltrated Stormwater – Design Rainfall Event (25mm)**		**Estimated Total Daily Water Takings**	
L/day	**L/min**	**L/day**	**L/min**	**L/day**	**L/min**
0	0	0	0	0	0

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

The lowest elevation of the proposed structure (taken as the base of subfloor drainage layer) at the site will be below the determined MAGWL. A fully waterproofed underground structure will be required at this site.

As on-site management of stormwater or groundwater (which includes creating a watertight basement structure) is technologically feasible, it may also be possible to obtain a Long Term Storm/Sanitary Discharge Exemption for the purpose of a **temporary, emergency foundation drainage** connection to the City's Sewers. Note however, that all conditions and requirements within Sections 4 and 5 of Toronto Water's Foundation Drainage Policy must be met for an exemption to be considered.

The City of Toronto will require Discharge Agreements in the short term, if any water is to be discharged to the storm or sanitary sewers.

Please note:

- 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 either the dewatering contractor retained or the mechanical consultant.
- If an emergency repair connection is proposed, the pump schedule for this connection has not been completed. The actual emergency discharge rate is not available at the time writing of this report. The pump schedule must be specified by the mechanical consultant.
- On-site containment (infiltration gallery/dry well etc.) has not been considered as part of the proposed development at this time. If this option is considered, additional work will have to be conducted (i.e. infiltration testing).

11 Evaluation of Impact

11.1 Zone of Influence

Localized dewatering of an aquifer produces a cone-shaped depression in the groundwater table that extends some distance away from the dewatering point. The lateral distance which the cone of depression extends (i.e., the distance to where drawdown is effectively zero) is known as the Zone of Influence (ZOI).

The ZOI was calculated using the Sichardt equation below.

$$R_0 = 3000(\Delta H)\sqrt{K}$$

ΔH	=	dewatering thickness (m)
K	=	hydraulic conductivity (m/s)
R_0	=	radius of influence (m)

The ZOI with respect to groundwater seepage at the site is summarized as follows.

Zone of Influence (ZOI)		
	Short Term (Construction), m	**Long Term (Permanent), m**
Soldier Pile and Lagging Scenario	19	0
Cutoff Wall Scenario	0	0

11.2 Land Stability

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

Land Stability		
	Short Term (Construction)	**Long Term (Permanent)**
Dewatering Thickness (m)	2.1	0
Increase in Effective Stress (kPa)	21	0
Maximum Theoretical Settlement due to Dewatering (mm)	1	0
Public Realm Theoretical Settlement due to Dewatering (mm)	<1	0

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.

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 waterbody. 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 has been completed under a separate cover.

12 Proposed Mitigation Measures and Monitoring Plan

As a result of dewatering and draining the soil, changes in groundwater level have the potential to cause settlement based on the change in the effective stresses within the ZOI. The extent of the negative impact identified in previous sections will be limited to the ZOI caused by the groundwater taking at the site.

If adjacent buildings or municipal infrastructure are within the ZOI and will undergo settlement that may be considered unacceptable as identified the Land Stability Section, consideration should be given to implement a monitoring and mitigation program during dewatering activities.

A caisson cutoff wall shoring system is also provided. This system will provide additional risk mitigation against loss of ground, and will limit the ZOI to 0 m per the above sections.

The temporary construction dewatering system must be properly installed and screened to ensure sediments and fines will not be removed, which 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.

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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.

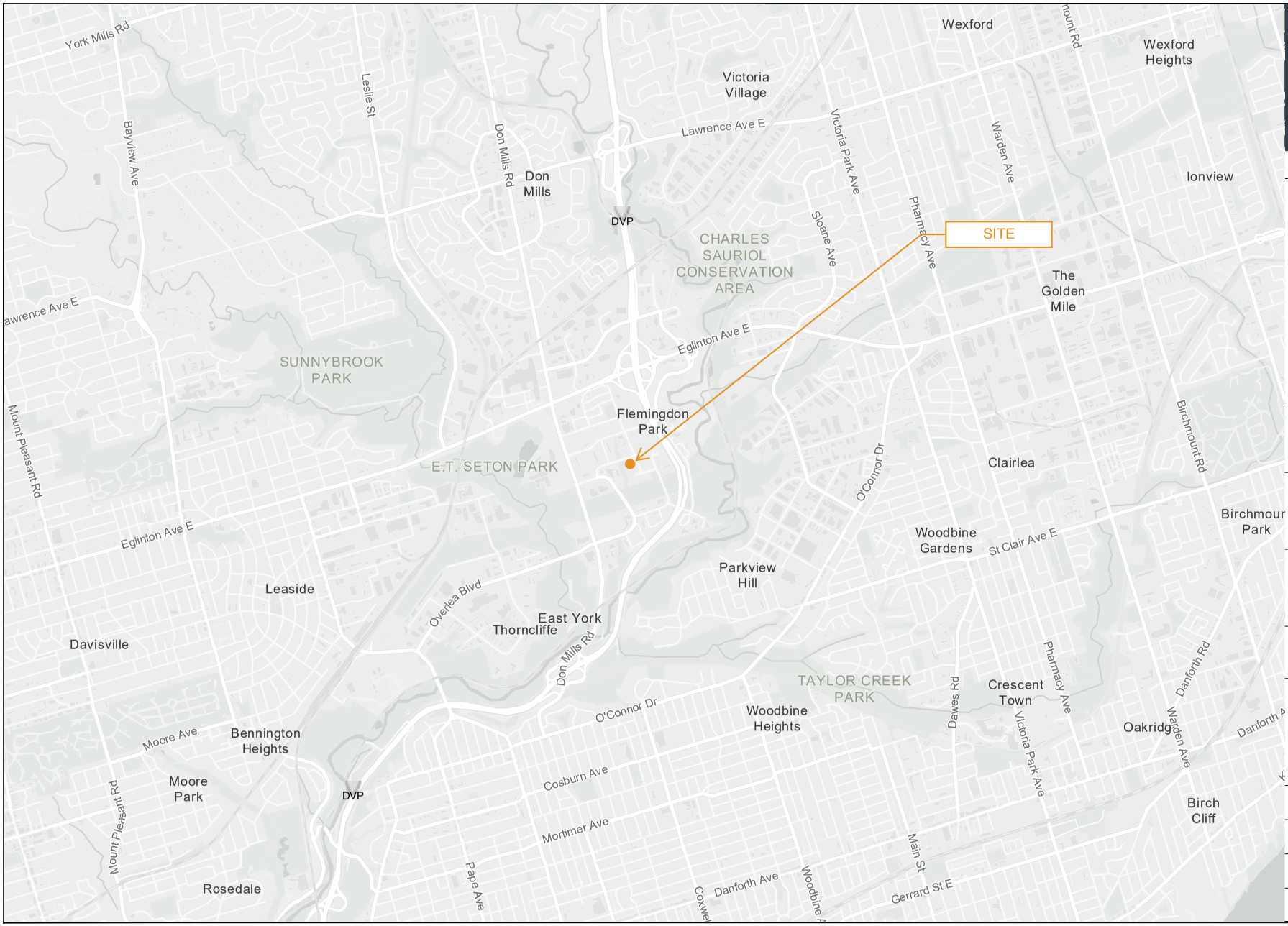
For and on behalf of our team,

GROUNDED ENGINEERING

Andrew Kernerman B.A.Sc., EIT.
Project Coordinator

Michael Diez de Aux, M.A.Sc., P.Geo., P.Eng.
Associate

FIGURES



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LEGEND

APPROXIMATE SITE LOCATION

Note

Reference
ArcGIS Online 2024

Project
45 GRENOBLE DRIVE, TORONTO, ONTARIO

Figure Title
SITE LOCATION PLAN

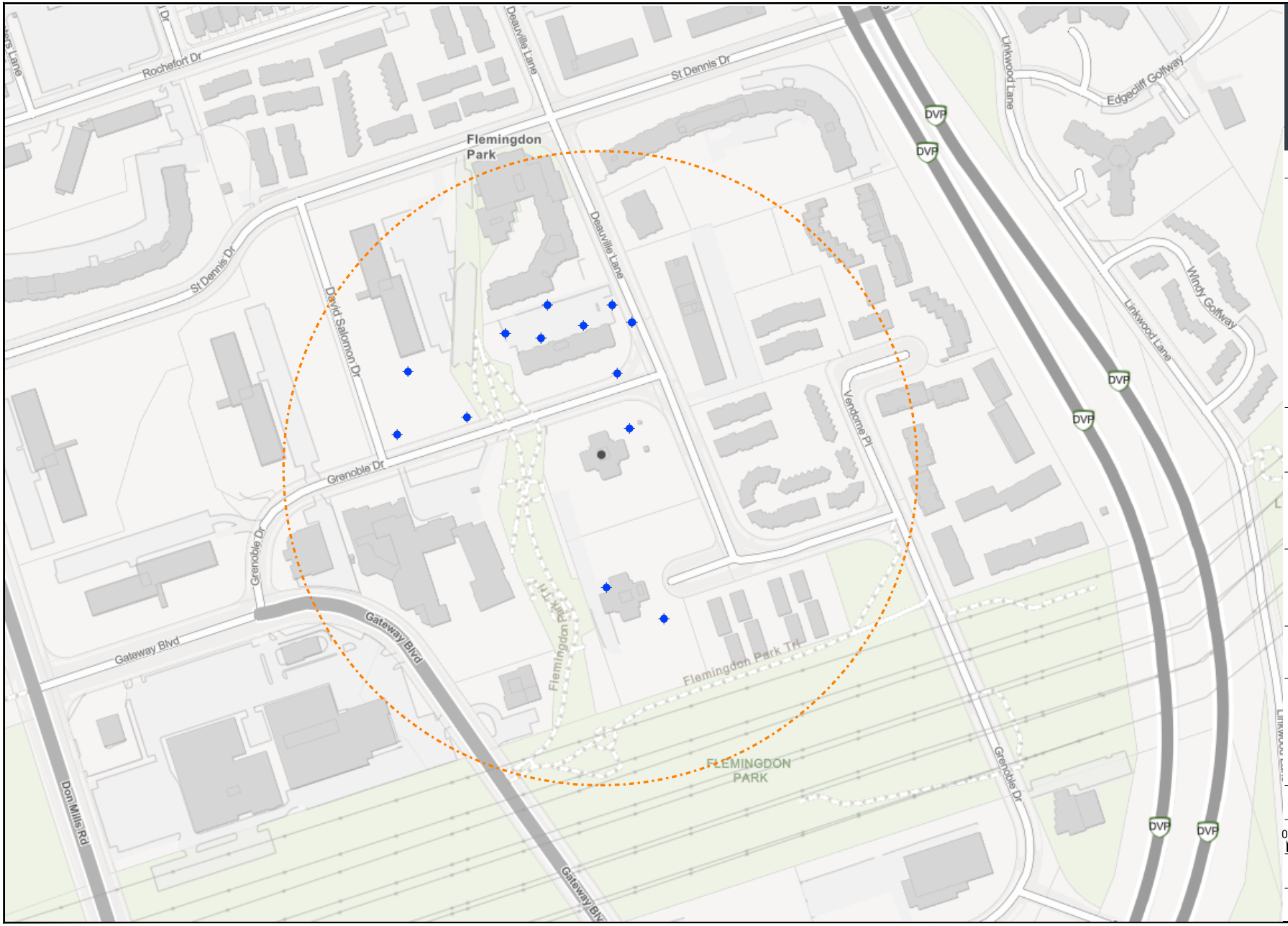
North
TRUE
PROJECT

Date
SEPTEMBER 2024

Scale
NTS

Job No
24-076

Figure No
FIGURE 1



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LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- STUDY AREA (250 m RADIUS)
- MECP WELL LOCATION

Note

Reference
ArcGIS Online 2024

Project
45 GRENOBLE DRIVE, TORONTO, ONTARIO

Figure Title
STUDY AREA MAP

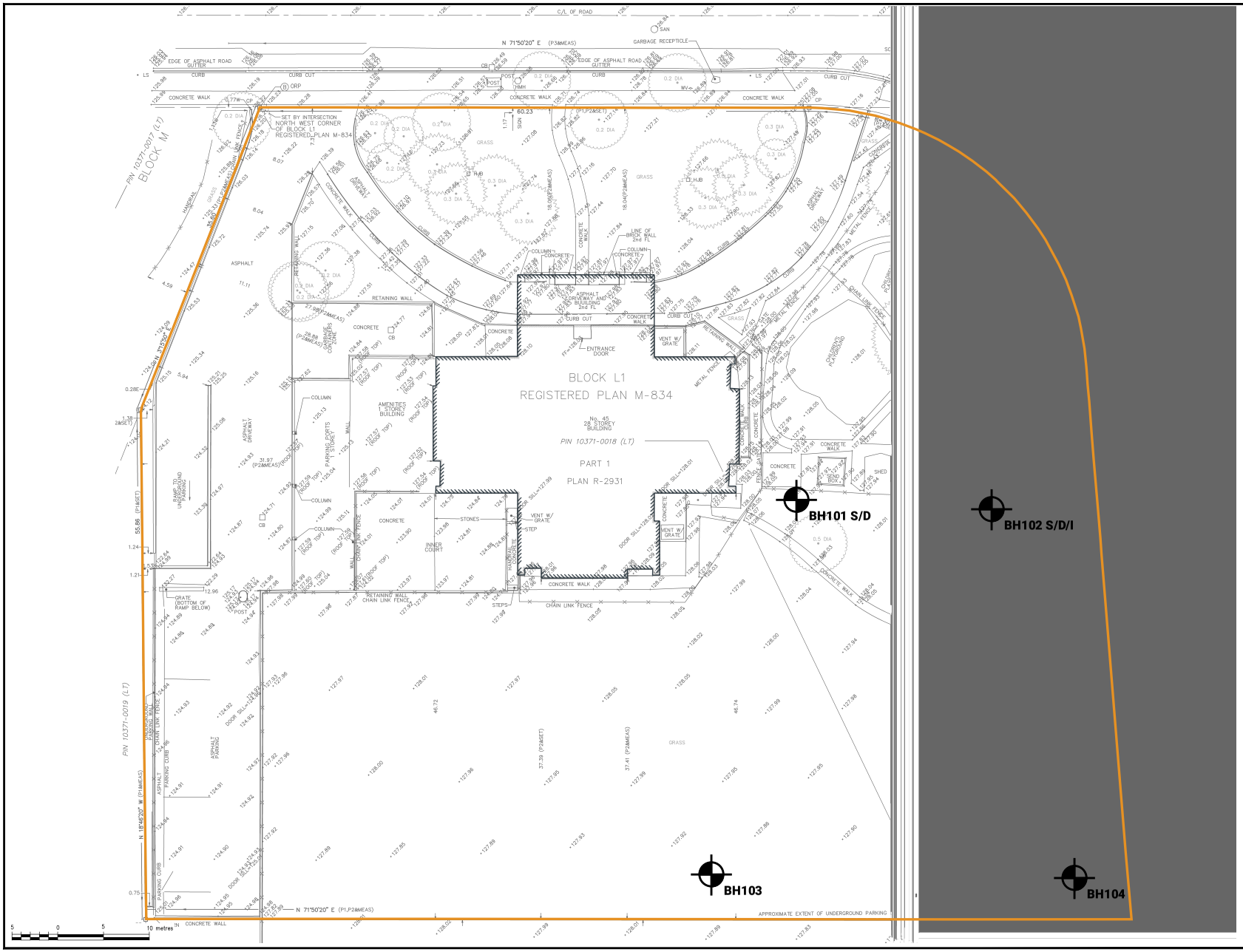
North

Date
SEPTEMBER 2024

Scale
0m 50m 100m

Job No
24-076

Figure No
FIGURE 2



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LEGEND

- PROPERTY BOUNDARY
- EXISTING BUILDING STRUCTURE
- MONITORING WELL/BOREHOLE BY GROUNDED

Note

Reference

Site survey prepared by JD Barnes
Dated March 20, 2023

Project

45 GRENOBLE DRIVE
TORONTO, ONTARIO

Figure Title

BOREHOLE LOCATION PLAN
EXISTING CONDITIONS

North

TRUE
PROJECT

Date

SEPTEMBER 2024

Scale

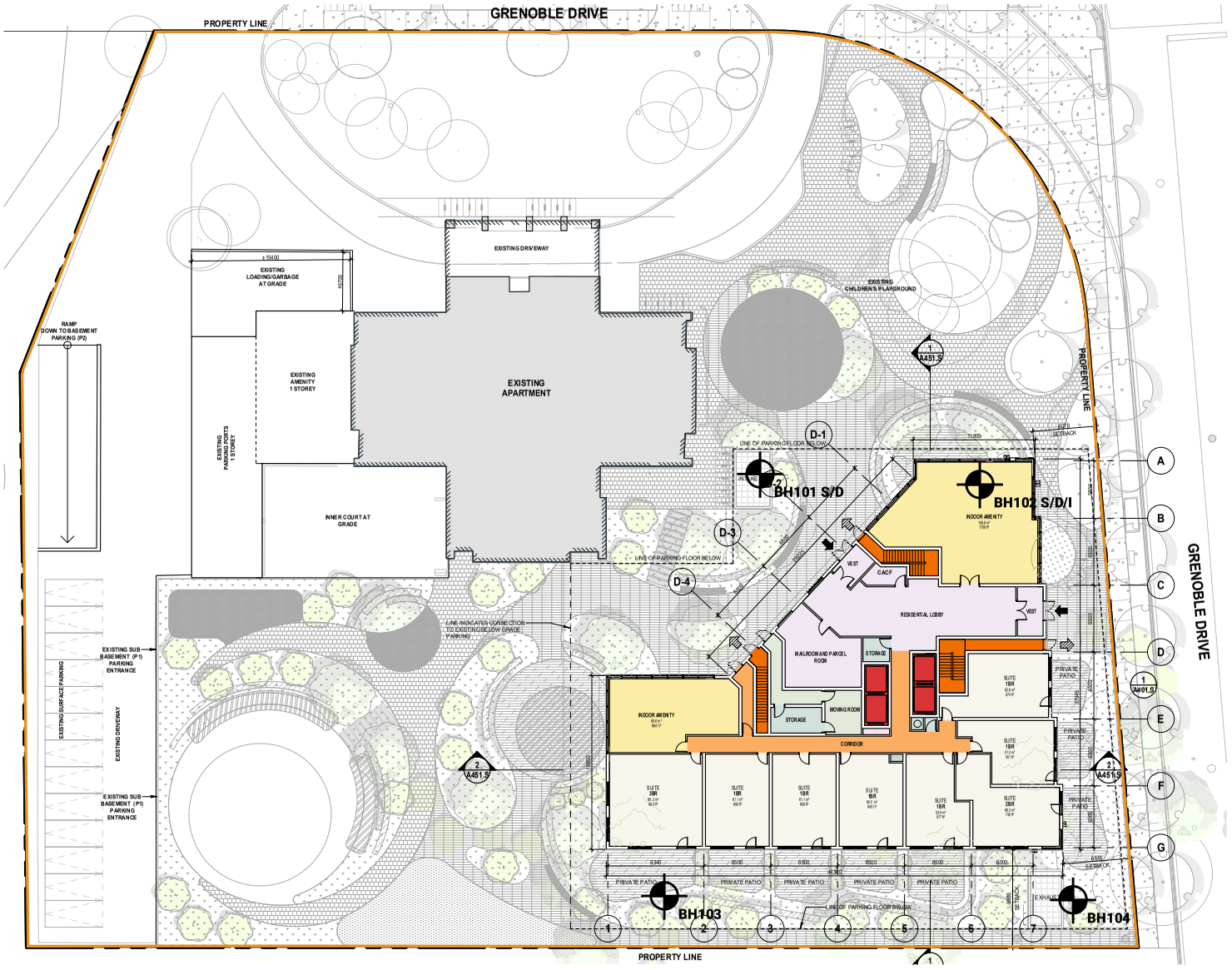
AS INDICATED

Job No

24-059

Figure No

FIGURE 3



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LEGEND

- PROPERTY BOUNDARY
- EXISTING BUILDING STRUCTURE
- MONITORING WELL/BOREHOLE BY GROUNDED

Note

Reference

Architectural Drawings prepared by BDP Quadrangle Ltd.

Dated November 26, 2024

Project

45 GRENOBLE DRIVE TORONTO, ONTARIO

Figure Title

BOREHOLE LOCATION PLAN PROPOSED CONDITIONS

North

Date

DECEMBER 2024

Scale

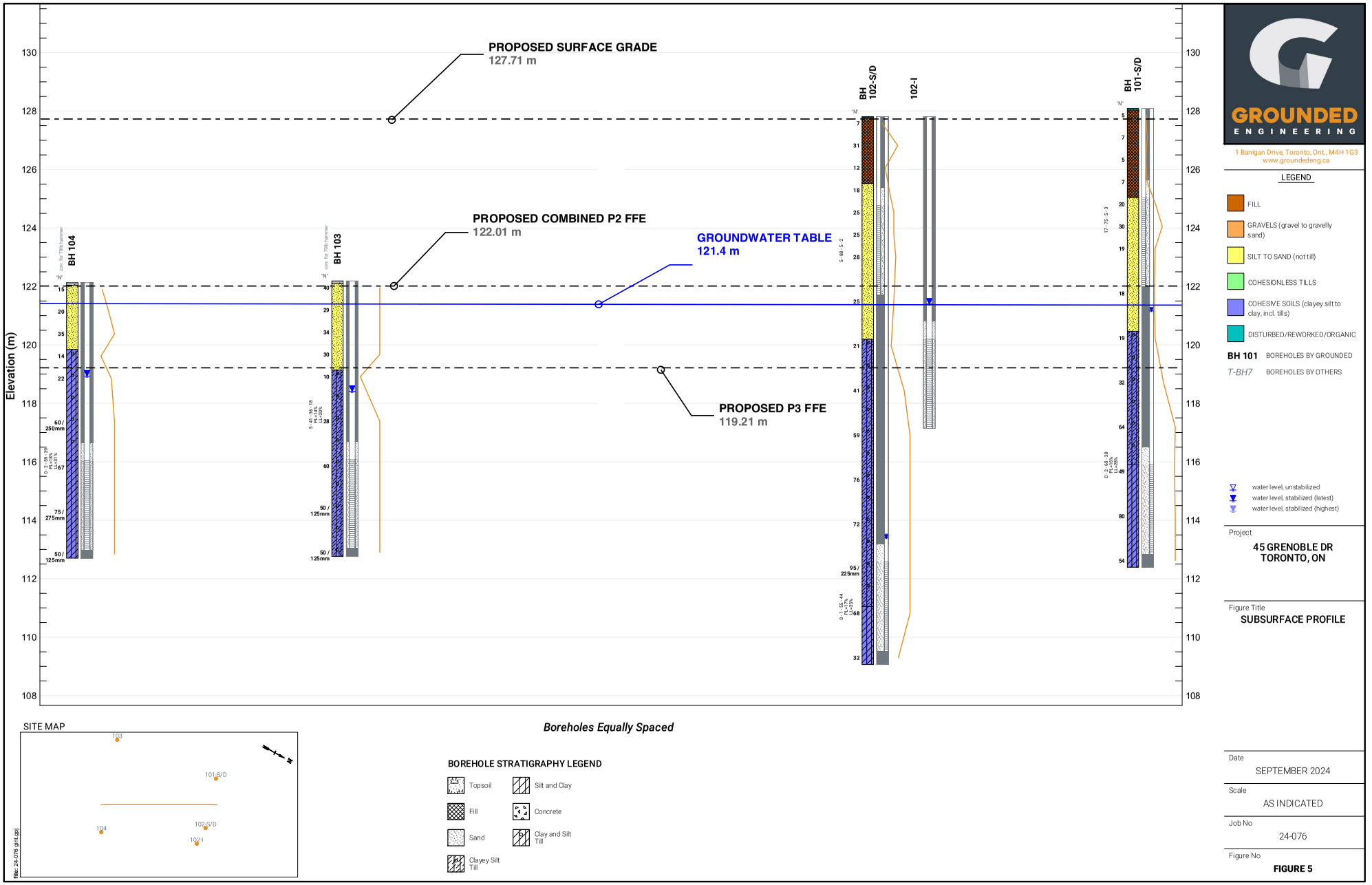
0m 6.25m 12.5m

Job No

24-059

Figure No

FIGURE 4



SITE MAP

Boreholes Equally Spaced

BOREHOLE STRATIGRAPHY LEGEND

- Topsoil
- Fill
- Sand
- Clayey Silt Till
- Silt and Clay
- Concrete
- Clay and Silt Till

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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
- **BH 101** BOREHOLES BY GROUNDED
- *T-BH7* BOREHOLES BY OTHERS

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

Project
45 GRENOBLE DR TORONTO, ON

Figure Title
SUBSURFACE PROFILE

Date
SEPTEMBER 2024

Scale
AS INDICATED

Job No
24-076

Figure No
FIGURE 5

File: 24-076 grnt.gpj

APPENDIX A

BOREHOLE LOG TERMINOLOGY

GROUNDED ENGINEERING

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

NP: non-plastic

γ: soil unit weight (bulk)

G_s: specific gravity

S_u: undrained shear strength

▽ unstabilized 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

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

COMPOSITION

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

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.

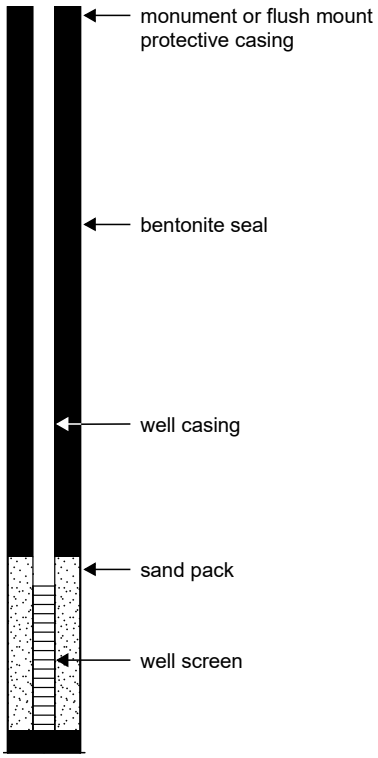
ASTM D3441 Cone Penetration Test (CPT)
Pushing an internal still rod with a outer hollow rod ("sleeve") tipped with a cone with an apex angle of 60° and a cross-sectional area of 1000 mm^2 into soil. The resistance is measured in the sleeve and at the tip to determine the skin friction and the tip resistance.

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



GROUNDED ENGINEERING

Date Started : May 29, 2024
Position : E: 634482, N: 4841687 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 101-S/D

File No. : 24-076 **Project** : 45 Grenoble Dr, Toronto, ON **Client** : Gateway Properties

drill method : CME 55

hollow stem augers OD=215 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
128.1	**GROUND SURFACE**				
	50mm **TOPSOIL**		1	SS	5
	FILL, sand, some silt, trace gravel, trace rootlets, loose, brown, moist		2	SS	7
			3	SS	5
			4	SS	7
125.1 3.0	**SAND**, some gravel, trace silt, trace clay, compact to dense, brown, moist		5	SS	20
			6	SS	30
			7	SS	19
	...at 6.1 m, light brown		8	SS	18
120.5 7.6	**CLAYEY SILT**, some sand to sandy, trace gravel, very stiff to hard, grey, moist (GLACIAL TILL)		9	SS	19
			10	SS	32
			11	SS	64
115.9 12.2	**SILT AND CLAY**, trace sand, hard, grey, moist		12	SS	49
	...at 13.7 m, light grey silt partings		13	SS	80
112.4 15.7			14	SS	54

depth scale (m) 0–15

well details: S, D

elevation (m) 128–113

undrained shear strength (kPa): unconfined, field vane, pocket penetrometer, Lab Vane; 40 80 120 160

SPT N-values (bpf): dynamic cone; 10 20 30 40

headspace vapour (ppm): hexane, isobutylene, methane; 100 200 300

moisture / plasticity: PL MC LL; 10 20 30

unstabilized water level

lab data and comments

grain size distribution (%) (MIT)

GR SA SI CL

17 75 5 3

0 2 60 38

END OF BOREHOLE

Borehole was dry upon completion of drilling.

S: 50 mm dia. monitoring well installed.
D: 50 mm dia. monitoring well installed.
No. 10 screen

101-S/D-S GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 6, 2024	dry	n/a
Jun 20, 2024	dry	n/a
Jul 5, 2024	dry	n/a
Jul 19, 2024	dry	n/a
Aug 2, 2024	dry	n/a
Aug 16, 2024	dry	n/a
Aug 30, 2024	dry	n/a

101-S/D-D GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 6, 2024	7.0	121.1
Jun 20, 2024	7.0	121.1
Jul 5, 2024	7.0	121.1
Jul 19, 2024	7.0	121.1
Aug 2, 2024	6.9	121.2
Aug 16, 2024	7.0	121.1
Aug 30, 2024	6.8	121.3

file: 24-076.gint.gpj

Tech : NA | **PM** : AK | **Rev** : MD

GROUNDED ENGINEERING

Date Started : May 27, 2024
Position : E: 634503, N: 4841693 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 102-S/D

File No. : 24-076 **Project** : 45 Grenoble Dr, Toronto, ON **Client** : Gateway Properties

drill method : CME 55

elev depth (m)	description	graphic log	number	type	SPT N-value
127.8	**GROUND SURFACE**				
	40mm **TOPSOIL**		1	SS	7
	FILL, sand, some silt, trace gravel, trace rootlets, organic odour, loose, brown, moist		2	SS	31
	...at 0.8 m, dense to compact		3	SS	12
125.5 / 2.3	**SAND**, trace gravel, trace silt, trace clay, compact, brown, moist		4	SS	18
			5	SS	25
			6	SS	25
			7	SS	28
	...at 6.1 m, wet		8	SS	25
120.2 / 7.6	**CLAYEY SILT**, some sand, trace gravel, very stiff to hard, grey, moist (GLACIAL TILL)		9	SS	21
			10	SS	41
			11	SS	59
	...at 12.2 m, light grey silt partings		12	SS	76
			13	SS	72
			14	SS	95 / 225mm
111.0 / 16.8	**SILT AND CLAY**, trace sand, hard, grey, moist		15	SS	68
			16	SS	32
109.1 / 18.7	**END OF BOREHOLE**				

hollow stem augers OD=215 mm

mud rotary lg OD=135 mm

depth scale (m) 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

well details: S, D

elevation (m) 127 126 125 124 123 122 121 120 119 118 117 116 115 114 113 112 111 110

undrained shear strength (kPa)
■ unconfined + field vane
● pocket penetrometer ○ Lab Vane
40 80 120 160

SPT N-values (bpf)
× dynamic cone
10 20 30 40

headspace vapour (ppm)
× hexane □ isobutylene △ methane
100 200 300

moisture / plasticity
PL MC LL
10 20 30

unstabilized water level

lab data and comments

grain size distribution (%) (MIT)
GR SA SI CL

5 88 5 2

0 1 55 44

Borehole was filled with drill water upon completion of drilling.

S: 50 mm dia. monitoring well installed.
D: 50 mm dia. monitoring well installed.
No. 10 screen

102-S/D-S GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 6, 2024	dry	n/a
Jun 20, 2024	dry	n/a
Jul 5, 2024	dry	n/a
Jul 19, 2024	dry	n/a
Aug 2, 2024	dry	n/a
Aug 16, 2024	dry	n/a
Aug 30, 2024	dry	n/a

102-S/D-D GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 6, 2024	17.2	110.6
Jun 20, 2024	15.9	111.9
Jul 5, 2024	15.2	112.6
Jul 19, 2024	14.6	113.2
Aug 2, 2024	14.4	113.4
Aug 16, 2024	14.4	113.4
Aug 30, 2024	14.4	113.4

file: 24-076.gint.gpj

Tech : NA | **PM** : AK | **Rev** : MD

GROUNDED ENGINEERING

Date Started : May 27, 2024
Position : E: 634511, N: 4841693 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 102-I

File No. : 24-076 **Project** : 45 Grenoble Dr, Toronto, ON **Client** : Gateway Properties

drill method : CME 55

hollow stem augers OD=215 mm

elev depth (m)	description	graphic log	samples: number	samples: type	samples: SPT N-value
127.8	**GROUND SURFACE**				
	Refer to Borehole 102-S/D				

depth scale (m) 0 1 2 3 4 5 6 7 8 9 10

well details

elevation (m) 127 126 125 124 123 122 121 120 119 118

undrained shear strength (kPa)
■ unconfined + field vane
● pocket penetrometer ○ Lab Vane
40 80 120 160

SPT N-values (bpf)
× dynamic cone
10 20 30 40

headspace vapour (ppm)
× hexane □ isobutylene
△ methane
100 200 300

moisture / plasticity
PL MC LL
10 20 30

unstabilized water level

lab data and comments

grain size distribution (%) (MIT)
GR SA SI CL

END OF BOREHOLE

Borehole was dry upon completion of drilling.

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

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 6, 2024	6.5	121.3
Jun 20, 2024	6.5	121.3
Jul 5, 2024	6.5	121.3
Jul 19, 2024	6.4	121.4
Aug 2, 2024	6.5	121.3
Aug 16, 2024	6.5	121.3
Aug 30, 2024	6.5	121.3

file: 24-076.gint.gpj

Tech : NA | **PM** : AK | **Rev** : MD

GROUNDED ENGINEERING

Date Started : May 29, 2024
Position : E: 634488, N: 4841641 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 103

File No. : 24-076 **Project** : 45 Grenoble Dr, Toronto, ON **Client** : Gateway Properties

drill method : *Hilti DD350*

elev depth (m)	description	graphic log	number	type	SPT N-value*
122.2	**TOP OF SLAB**				
	90mm **CONCRETE**		1	SS	40
	SAND, trace silt, trace gravel, compact to dense, brown, moist		2	SS	29
	...at 0.8 m, wet		3	SS	34
			4	SS	30
119.2					
3.0	**CLAYEY SILT**, some sand, trace gravel, stiff to very stiff, grey, moist (GLACIAL TILL)		5	SS	10
	...at 4.6 m, seam of sand and silt		6	SS	28
	...at 6.1 m, hard		7	SS	60
			8	SS	50 / 125mm
112.8			9	SS	50 / 125mm
9.4					

hollow stem augers OD=215 mm

mud rotary lg OD=135 mm

depth scale (m) | well details | elevation (m)

undrained shear strength (kPa): unconfined, field vane, pocket penetrometer, Lab Vane; 40 80 120 160

SPT N-values (bpf): dynamic cone; 10 20 30 40

headspace vapour (ppm): hexane, isobutylene, methane; 100 200 300

moisture / plasticity: PL MC LL; 10 20 30

unstabilized water level

lab data and comments

grain size distribution (%) (MIT)

GR SA SI CL

5 41 36 18

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)
Jun 6, 2024	7.4	114.8
Jun 20, 2024	6.8	115.4
Jul 5, 2024	5.5	116.7
Jul 19, 2024	4.6	117.6
Aug 2, 2024	4.0	118.2
Aug 16, 2024	3.8	118.4
Aug 30, 2024	3.5	118.7

file: 24-076.gint.gpj

Tech : IH | **PM** : AK | **Rev** : MD

* SPT N-values corrected based on energy of 32 kg hammer dropped 760 mm

GROUNDED ENGINEERING

Date Started : May 27, 2024
Position : E: 634526, N: 4841654 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 104

File No. : 24-076 **Project** : 45 Grenoble Dr, Toronto, ON **Client** : Gateway Properties

drill method : Hilti DD350

elev depth (m)	description	graphic log	number	type	SPT N-value*
122.1	**TOP OF SLAB**				
	90mm **CONCRETE**		1	SS	15
	SAND, trace silt, trace gravel, compact to dense, brown, moist ...at 0.8 m, wet		2A 2B	SS	20
			3	SS	35
119.8 2.3	**CLAY AND SILT**, some sand, trace gravel, stiff to very stiff, grey, moist (GLACIAL TILL)		4	SS	14
			5	SS	22
	...at 4.6 m, hard		6	SS	60 / 250mm
116.0 6.1	**SILT AND CLAY**, trace sand, hard, grey, moist		7	SS	67
			8	SS	75 / 275mm
112.7 9.4			9	SS	50 / 125mm

hollow stem augers OD=215 mm

mud rotary lg OD=135 mm

depth scale (m): 0 1 2 3 4 5 6 7 8 9

well details

elevation (m): 122 121 120 119 118 117 116 115 114 113

undrained shear strength (kPa)
■ unconfined + field vane
● pocket penetrometer ○ Lab Vane
40 80 120 160

SPT N-values (bpf)
× dynamic cone
10 20 30 40

headspace vapour (ppm)
× hexane □ isobutylene △ methane
100 200 300

moisture / plasticity
PL MC LL
10 20 30

unstabilized water level

lab data and comments

grain size distribution (%) (MIT)
GR SA SI CL
0 2 59 39

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)
Jun 6, 2024	7.0	115.1
Jun 20, 2024	5.9	116.2
Jul 5, 2024	4.2	117.9
Jul 19, 2024	3.6	118.5
Aug 2, 2024	3.4	118.7
Aug 16, 2024	3.2	118.9
Aug 30, 2024	3.2	118.9

file: 24-076.gint.gpj

Tech : IH | **PM** : AK | **Rev** : MD

* SPT N-values corrected based on energy of 32 kg hammer dropped 760 mm

TABLE 1
GROUNDWATER LEVEL MONITORING SUMMARY
45 Grenoble Drive
TORONTO, ON
24-076

Well ID	Ground Surface Elevation (masl)	Grounded Engineering														Minimum Elev. (Lowest)		Maximum Elev. (Highest)		Seasonal Fluctuation
		June 6, 2024		June 20, 2024		July 5, 2024		July 19, 2024		August 2, 2024		August 16, 2024		August 30, 2024						
		(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(±m)
BH101-D	128.1	6.98	121.12	6.99	121.11	6.99	121.11	6.98	121.12	6.93	121.17	6.95	121.15	6.78	121.32	6.99	121.11	6.78	121.32	0.21
BH101-S	128.1	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	0.00	0.00	0.00	0.00	0.00
BH102-D	127.8	17.18	110.62	15.92	111.88	15.22	112.58	14.56	113.24	14.41	113.39	14.44	113.36	14.41	113.39	17.18	110.62	14.41	113.39	2.77
BH102-I	127.8	6.51	121.29	6.52	121.28	6.54	121.26	6.44	121.36	6.47	121.33	6.45	121.35	6.50	121.30	6.54	121.26	6.44	121.36	0.10
BH102-S	127.8	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	Dry	-	0.00	0.00	0.00	0.00	0.00
BH103	122.2	7.38	114.82	6.75	115.45	5.49	116.71	4.59	117.61	4.04	118.16	3.81	118.39	3.46	118.74	7.38	114.82	3.46	118.74	3.92
BH104	122.1	7.04	115.06	5.85	116.25	4.23	117.87	3.59	118.51	3.35	118.75	3.23	118.87	3.16	118.94	7.04	115.06	3.16	118.94	3.88

mbgs = metres below existing ground surface
masl = metres above sea level
* = unstabilized groundwater level
NA = not available: unable to access monitoring well

APPENDIX B

GROUNDED ENGINEERING

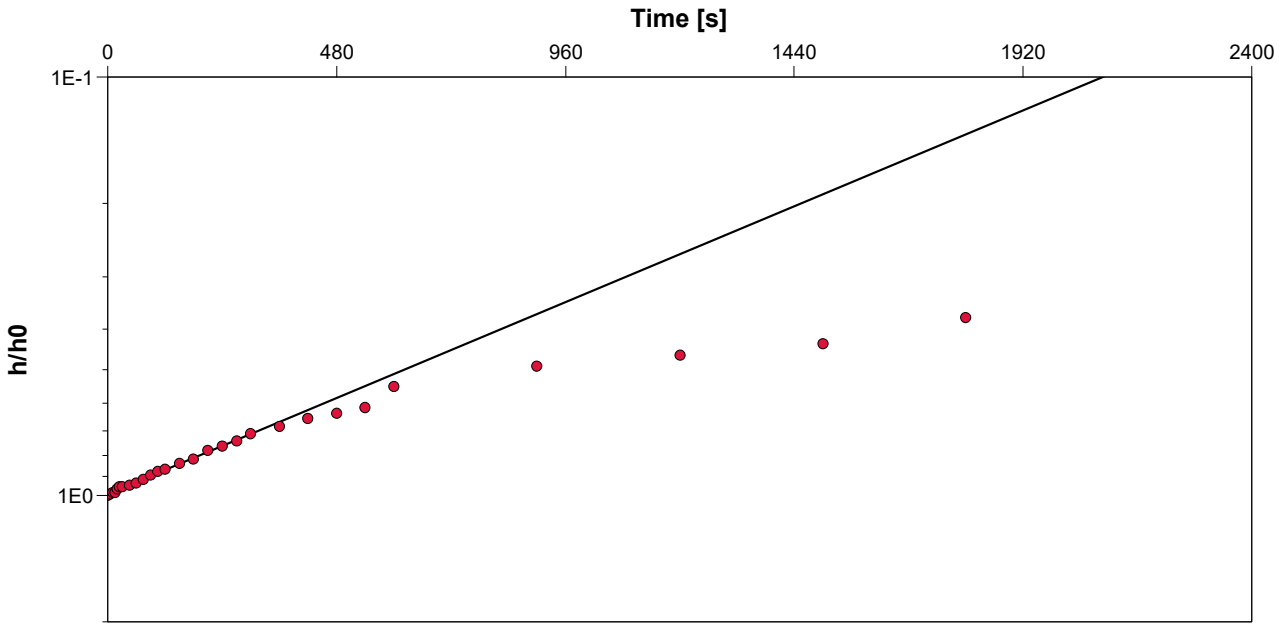
Slug Test Analysis Report

Project: 45 Grenoble

Number: 24-076

Client: Gateway Properties

Location: Toronto, ON	Slug Test: BH102-I	Test Well: BH102-I
Test Conducted by: IH		Test Date: 2024-06-07
Analysis Performed by: AK	BH102-I	Analysis Date: 2024-07-22
Aquifer Thickness: 15.00 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH102-I	4.44×10^{-7}	

GROUNDED ENGINEERING

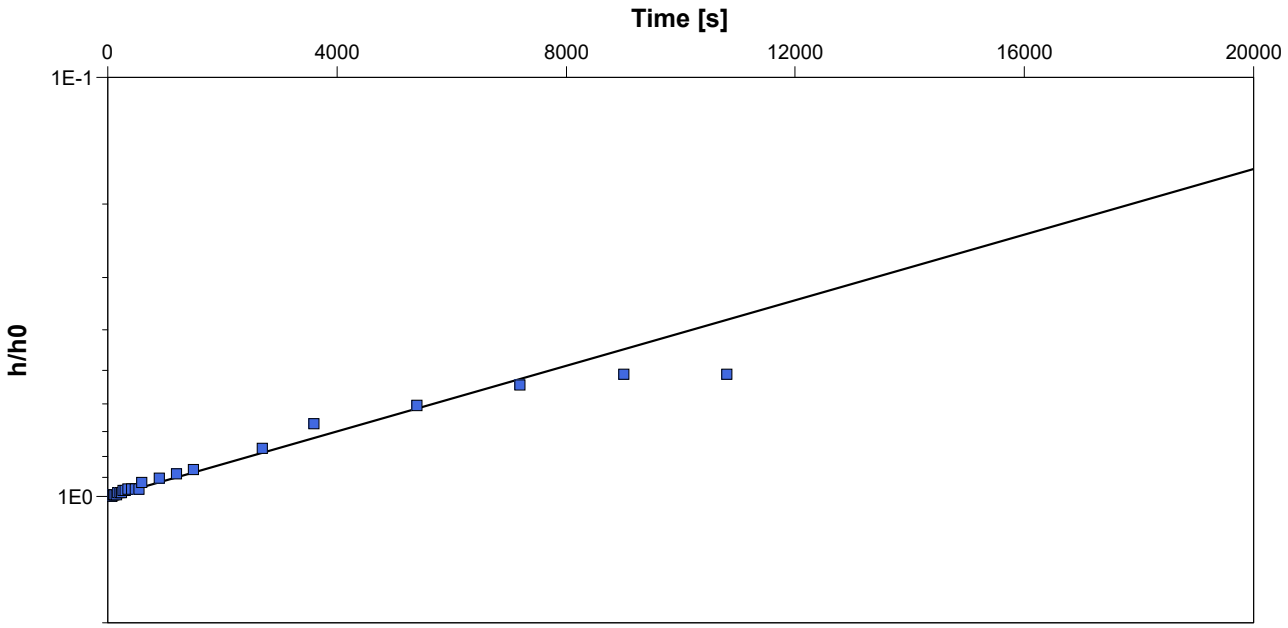
Slug Test Analysis Report

Project: 45 Grenoble

Number: 24-076

Client: Gateway Properties

Location: Toronto, ON	Slug Test: BH102-D	Test Well: BH102-D
Test Conducted by: IH		Test Date: 2024-06-07
Analysis Performed by: Ak	BH102-D	Analysis Date: 2024-07-22
Aquifer Thickness: 15.00 m		

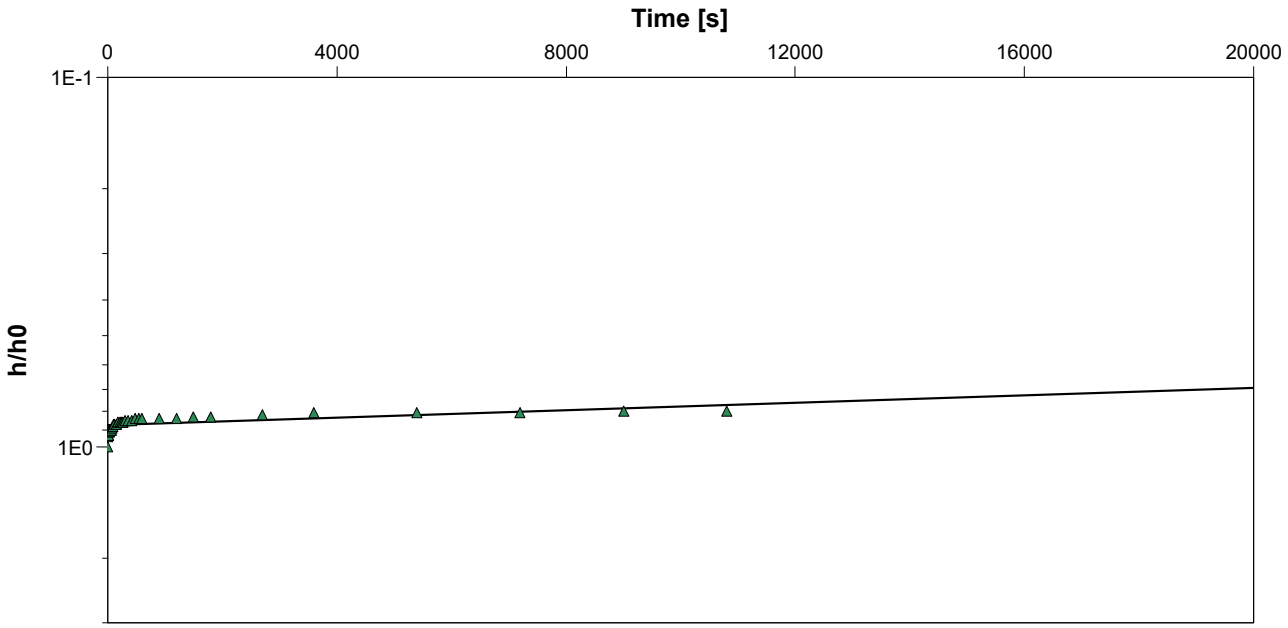


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH102-D	3.58×10^{-8}	

GROUNDED ENGINEERING	**Slug Test Analysis Report**
	Project: 45 Grenoble
	Number: 24-076
	Client: Gateway Properties

Location: Toronto, ON	Slug Test: BH103	Test Well: BH103
Test Conducted by: IH		Test Date: 2024-06-06
Analysis Performed by: AK	BH103	Analysis Date: 2024-07-22
Aquifer Thickness: 15.00 m		

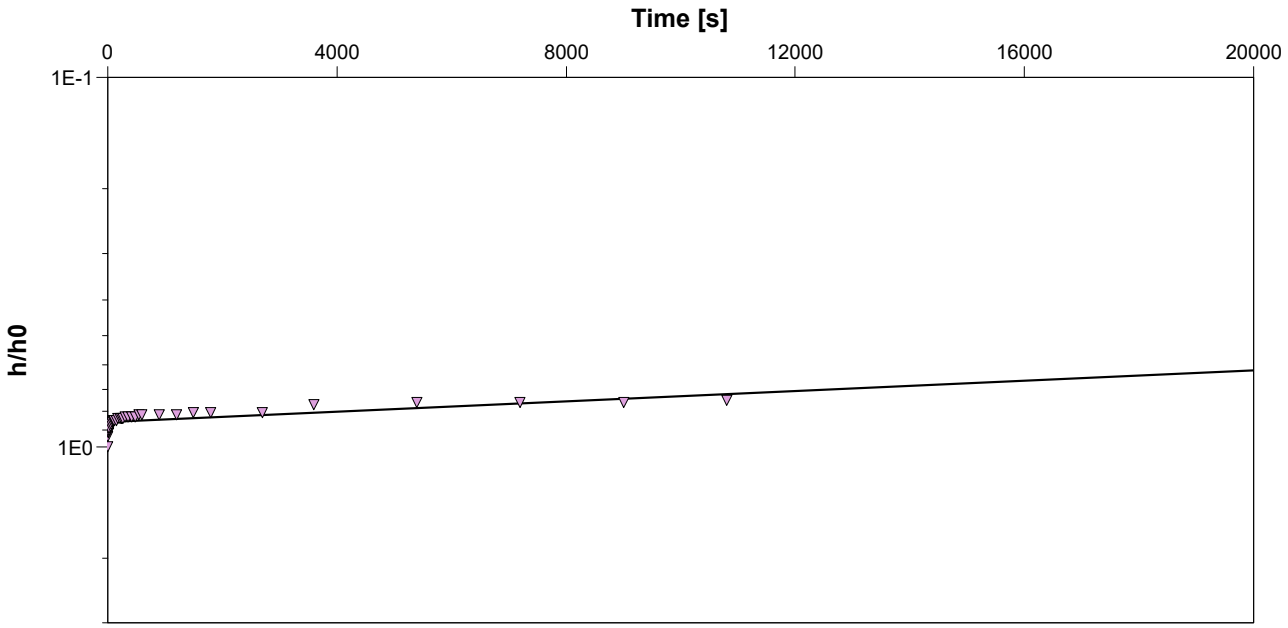


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH103	4.50×10^{-9}	

GROUNDED ENGINEERING	**Slug Test Analysis Report**
	Project: 45 Grenoble
	Number: 24-076
	Client: Gateway Properties

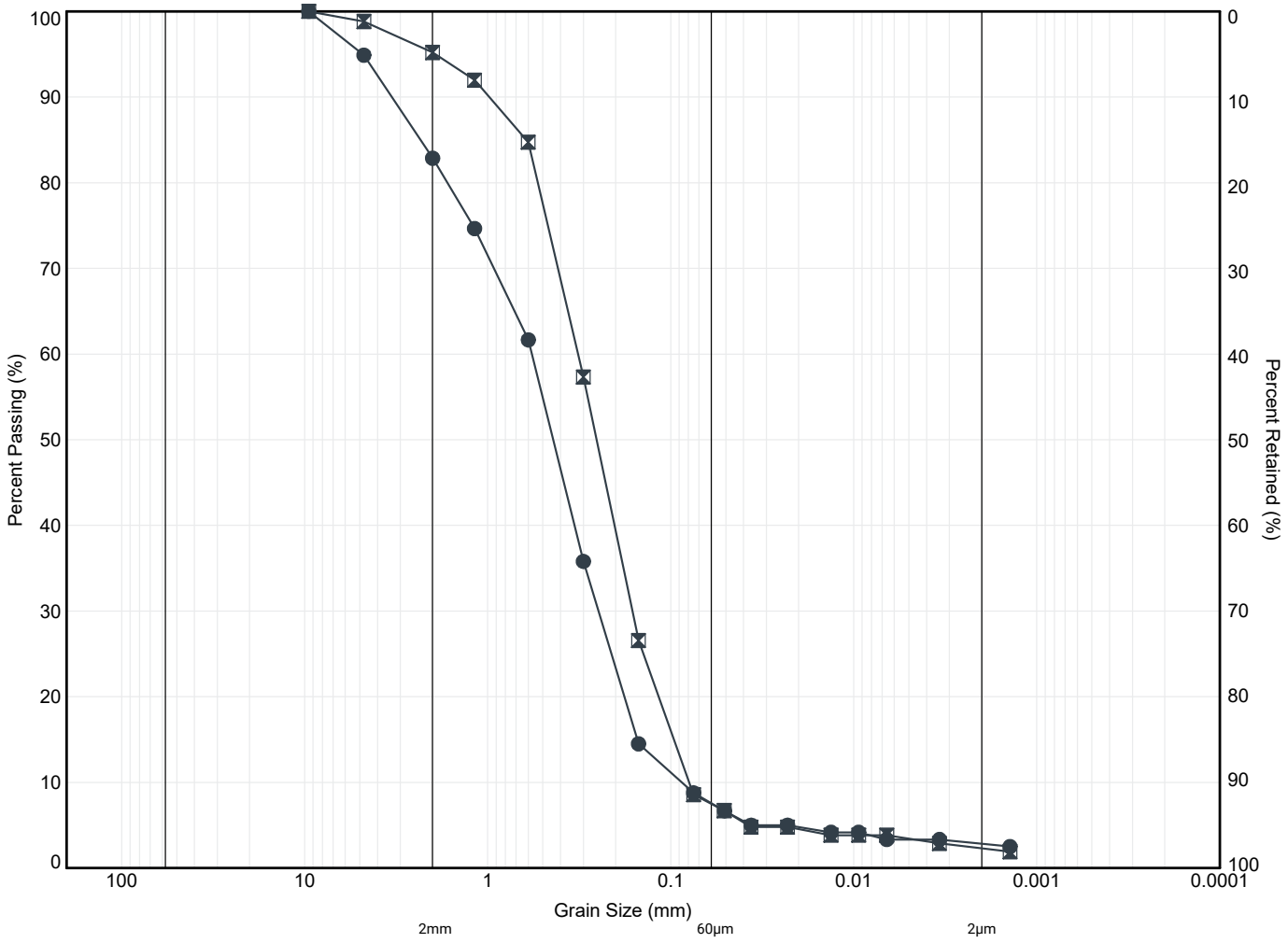
Location: Toronto, ON	Slug Test: BH104	Test Well: BH104
Test Conducted by: IH		Test Date: 2024-06-06
Analysis Performed by: AK	BH104	Analysis Date: 2024-07-22
Aquifer Thickness: 12.00 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH104	6.40×10^{-9}	

APPENDIX C



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

MIT SYSTEM

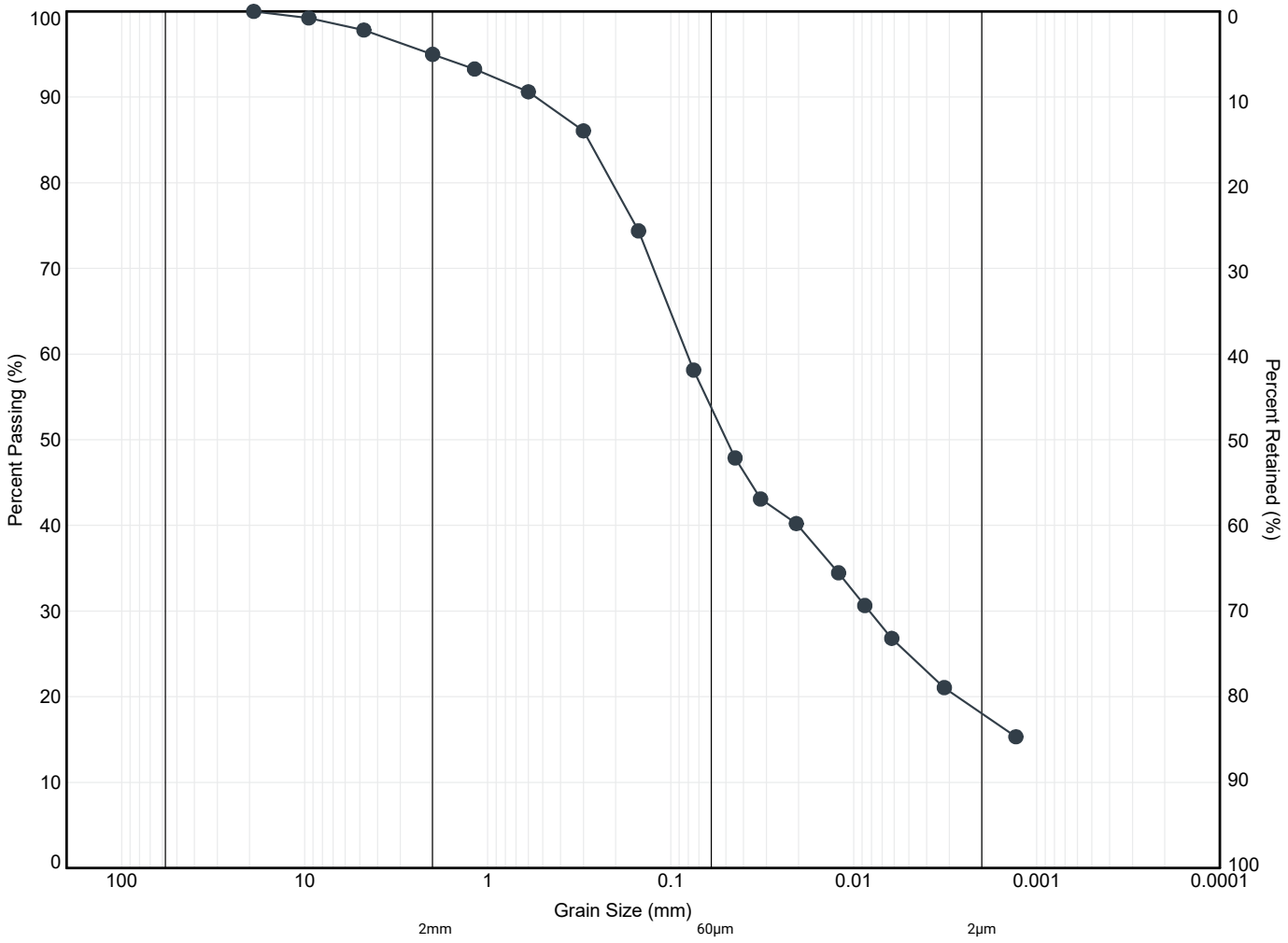
	Location	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
●	**BH 101**	SS6	4.0	124.0	17	75	5	3
⊠	**BH 102-S/D**	SS7	4.8	123.0	5	88	5	2

GROUNDED ENGINEERING

Title: **GRAIN SIZE DISTRIBUTION SANDS**

File No.: **24-076**

file: 24-076 gint.gpj



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

MIT SYSTEM

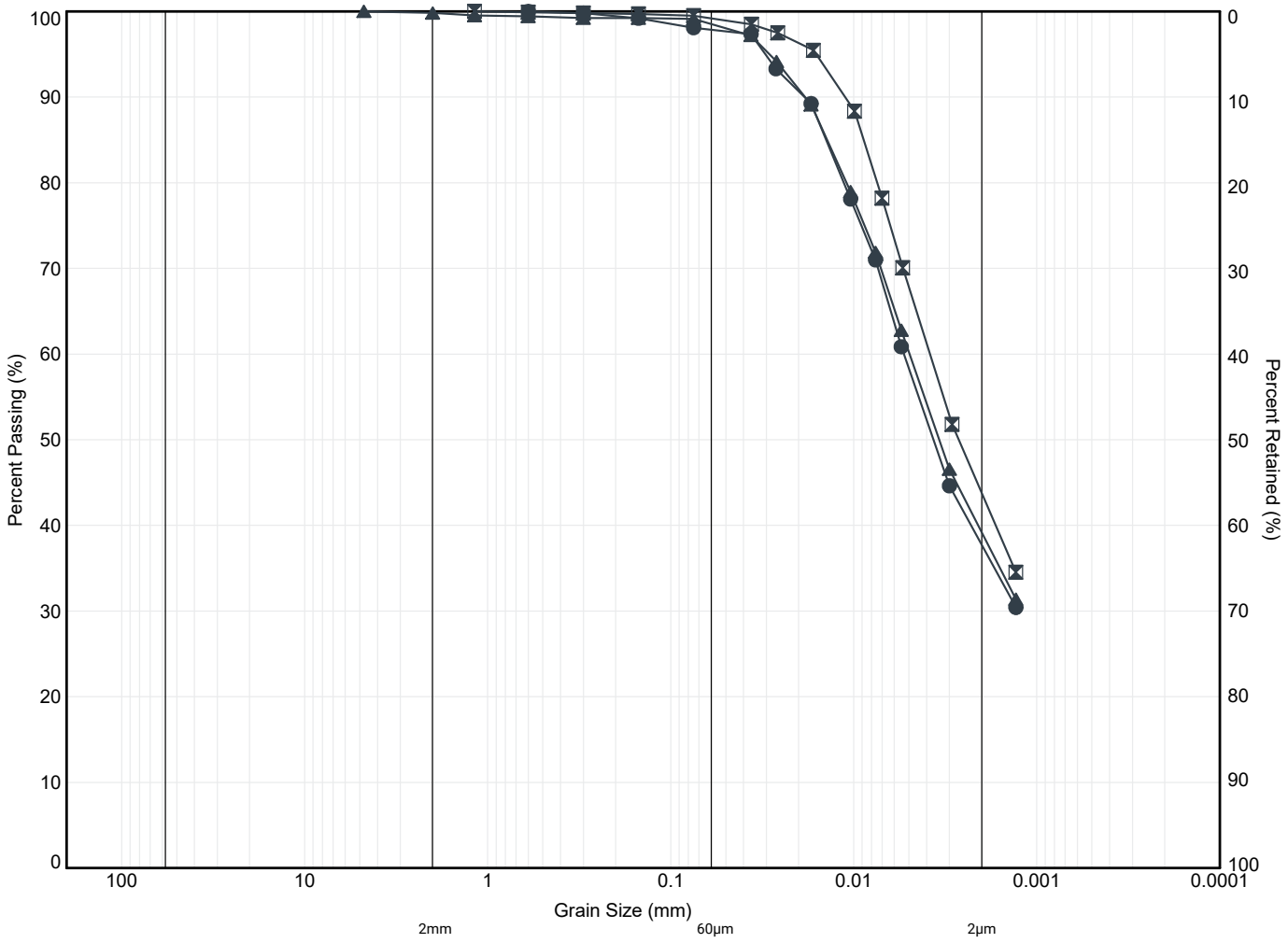
	Location	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
●	**BH 103**	SS6	4.8	117.4	5	41	36	18

GROUNDED ENGINEERING

Title: **GRAIN SIZE DISTRIBUTION**
GLACIAL TILL

File No.: **24-076**

file: 24-076 gint.gpj



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

MIT SYSTEM

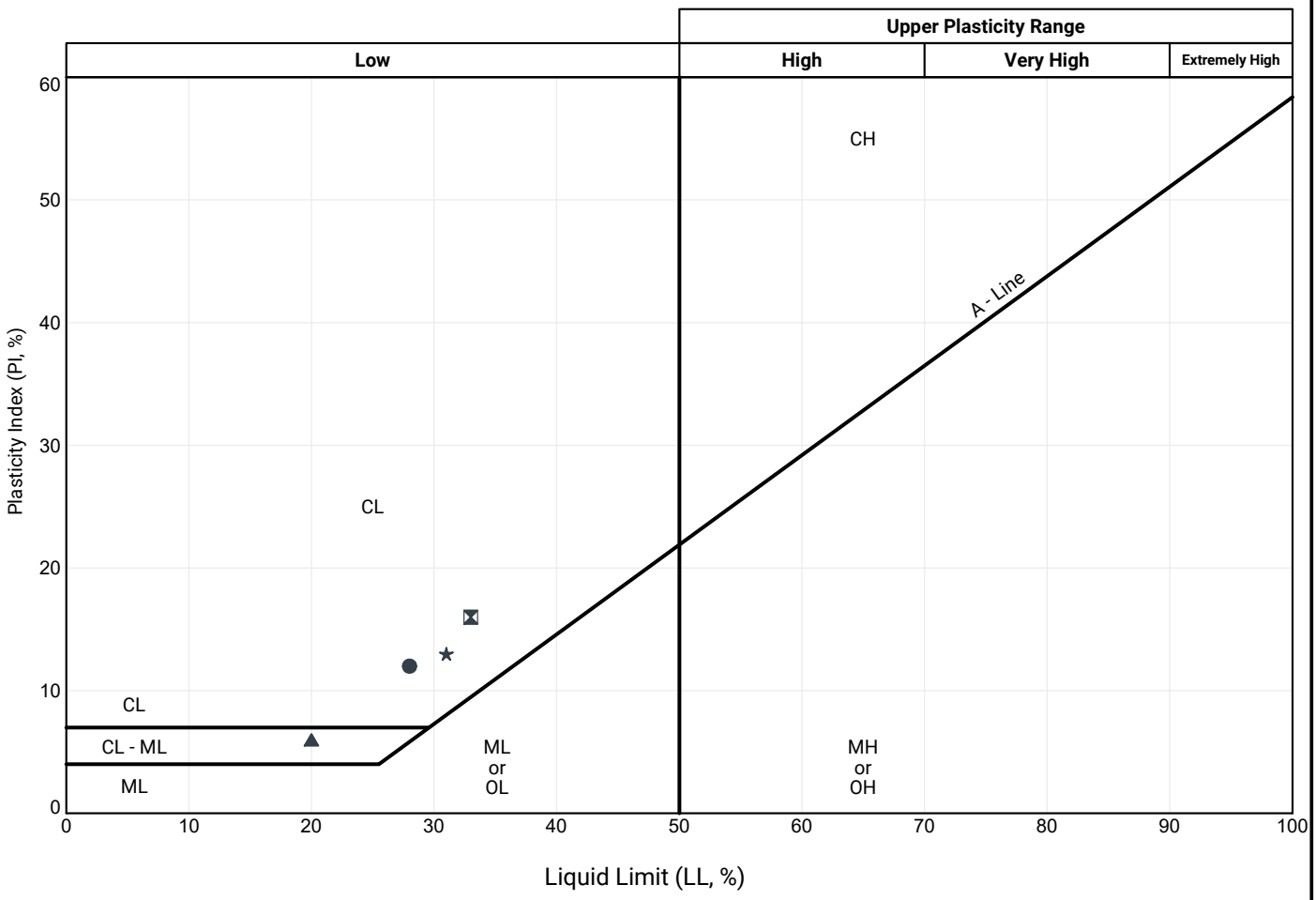
	Location	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
●	**BH 101**	SS12	12.4	115.7	0	2	60	38
⊠	**BH 102-S/D**	SS15	17.0	110.8	0	1	55	44
▲	**BH 104**	SS7	6.3	115.8	0	2	59	39

GROUNDED ENGINEERING

Title: **GRAIN SIZE DISTRIBUTION SILTS AND CLAYS**

File No.: **24-076**

file: 24-076 gint.gpj



	Location	Sample	Depth (m)	Elev. (m)	LL (%)	PL (%)	PI (%)
●	**BH 101**	SS12	12.4	115.7	28	16	12
⊠	**BH 102-S/D**	SS15	17.0	110.8	33	17	16
▲	**BH 103**	SS6	4.8	117.4	20	14	6
★	**BH 104**	SS7	6.3	115.8	31	18	13

GROUNDED ENGINEERING

Title: **ATTERBERG LIMITS CHART**

File No.: **24-076**

file: 24-076 gint.gpj

APPENDIX D

K from Grain Size Analysis Report

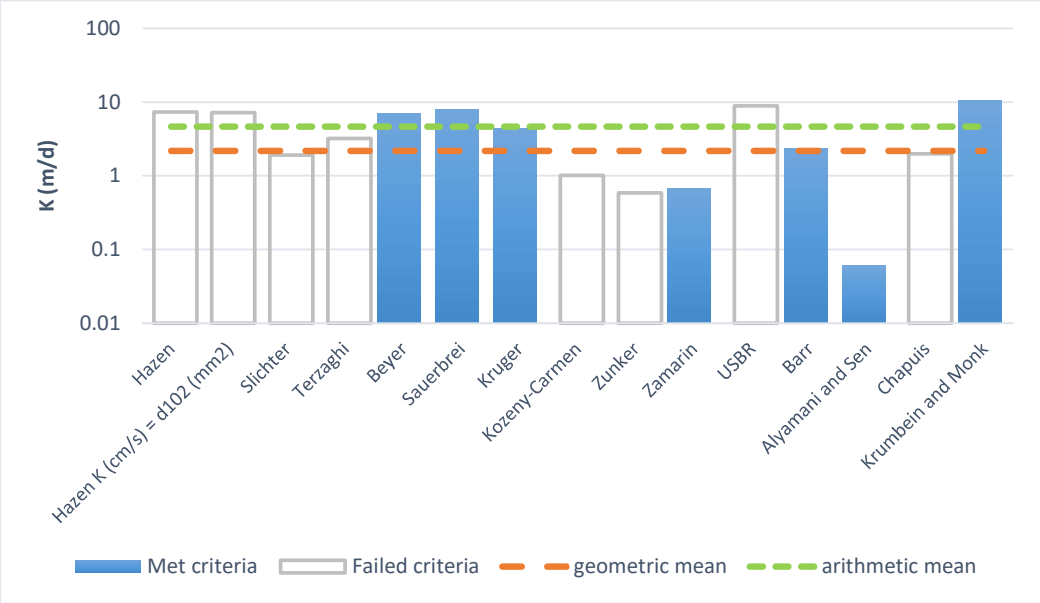
Date: 19-Jun-24

Sample Name: BH101-SS6

Mass Sample (g): 100

T (oC) 20

Poorly sorted gravelly sand low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	8.5E-03	8.5E-05	7.35	
Hazen K (cm/s) = d_{10} (mm)	8.3E-03	8.3E-05	7.15	
Slichter	2.2E-03	2.2E-05	1.90	
Terzaghi	3.7E-03	3.7E-05	3.21	
Beyer	8.1E-03	8.1E-05	6.99	
Sauerbrei	9.1E-03	9.1E-05	7.86	
Kruger	5.0E-03	5.0E-05	4.34	
Kozeny-Carmen	1.2E-03	1.2E-05	1.01	
Zunker	6.8E-04	6.8E-06	0.59	
Zamarin	7.8E-04	7.8E-06	0.68	
USBR	1.0E-02	1.0E-04	8.90	
Barr	2.7E-03	2.7E-05	2.36	
Alyamani and Sen	7.0E-05	7.0E-07	0.06	
Chapuis	2.3E-03	2.3E-05	1.98	
Krumbein and Monk	1.2E-02	1.2E-04	10.40	
geometric mean	2.5E-03	2.5E-05	2.19	
arithmetic mean	5.4E-03	5.4E-05	4.67	

K from Grain Size Analysis Report

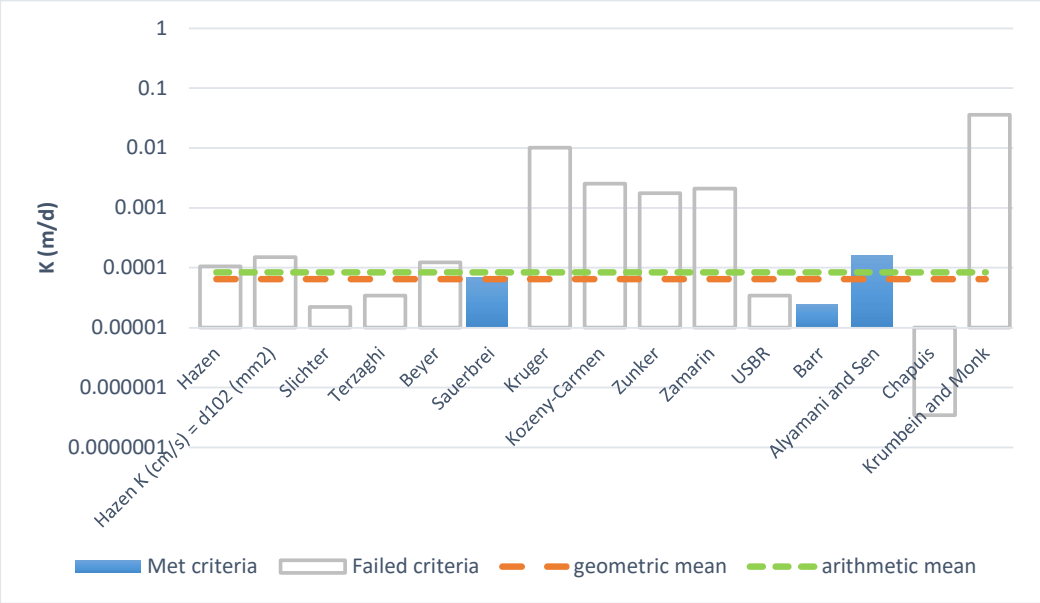
Date: 19-Jun-24

Sample Name: BH101-SS12

Mass Sample (g): 100

T (oC) 20

Poorly sorted clay with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	1.2E-07	1.2E-09	0.00	
Hazen K (cm/s) = d_{10} (mm)	1.7E-07	1.7E-09	0.00	
Slichter	2.6E-08	2.6E-10	0.00	
Terzaghi	3.9E-08	3.9E-10	0.00	
Beyer	1.4E-07	1.4E-09	0.00	
Sauerbrei	8.1E-08	8.1E-10	0.00	
Kruger	1.2E-05	1.2E-07	0.01	
Kozeny-Carmen	2.9E-06	2.9E-08	0.00	
Zunker	2.0E-06	2.0E-08	0.00	
Zamarin	2.4E-06	2.4E-08	0.00	
USBR	4.0E-08	4.0E-10	0.00	
Barr	2.9E-08	2.9E-10	0.00	
Alyamani and Sen	1.8E-07	1.8E-09	0.00	
Chapuis	4.0E-10	4.0E-12	0.00	
Krumbein and Monk	4.2E-05	4.2E-07	0.04	
geometric mean	7.5E-08	7.5E-10	0.00	
arithmetic mean	9.8E-08	9.8E-10	0.00	

K from Grain Size Analysis Report

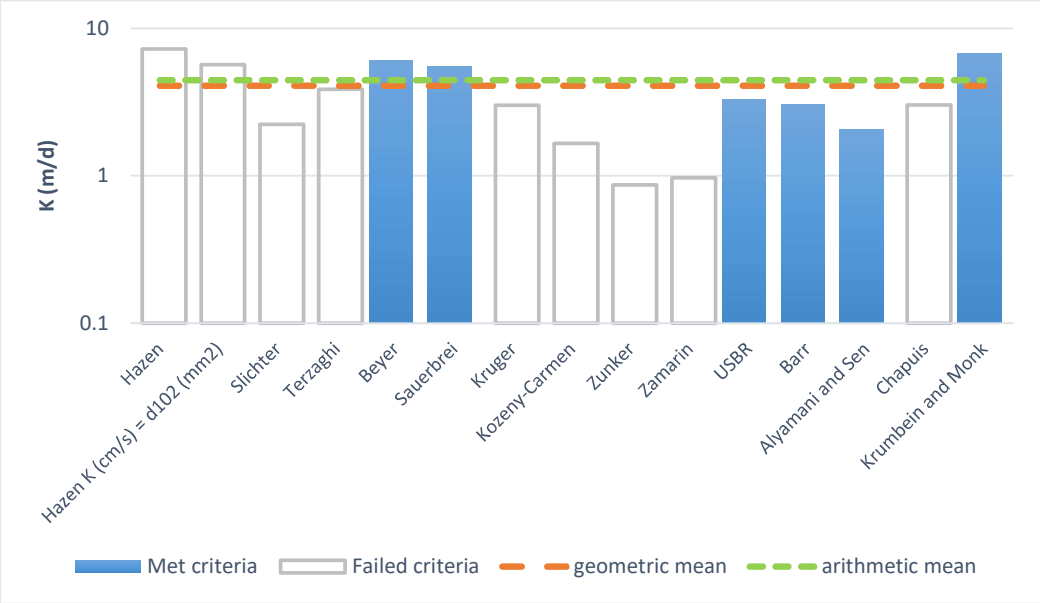
Date: 19-Jun-24

Sample Name: BH102-SS7

Mass Sample (g): 100

T (oC) 20

Moderately well sorted sand low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	8.4E-03	8.4E-05	7.24	
Hazen K (cm/s) = d_{10} (mm)	6.6E-03	6.6E-05	5.66	
Slichter	2.6E-03	2.6E-05	2.23	
Terzaghi	4.5E-03	4.5E-05	3.86	
Beyer	7.1E-03	7.1E-05	6.11	
Sauerbrei	6.4E-03	6.4E-05	5.52	
Kruger	3.5E-03	3.5E-05	3.01	
Kozeny-Carmen	1.9E-03	1.9E-05	1.66	
Zunker	1.0E-03	1.0E-05	0.87	
Zamarin	1.1E-03	1.1E-05	0.97	
USBR	3.8E-03	3.8E-05	3.30	
Barr	3.5E-03	3.5E-05	3.04	
Alyamani and Sen	2.4E-03	2.4E-05	2.05	
Chapuis	3.5E-03	3.5E-05	3.02	
Krumbein and Monk	7.8E-03	7.8E-05	6.71	
geometric mean	4.7E-03	4.7E-05	4.09	
arithmetic mean	5.2E-03	5.2E-05	4.45	

K from Grain Size Analysis Report

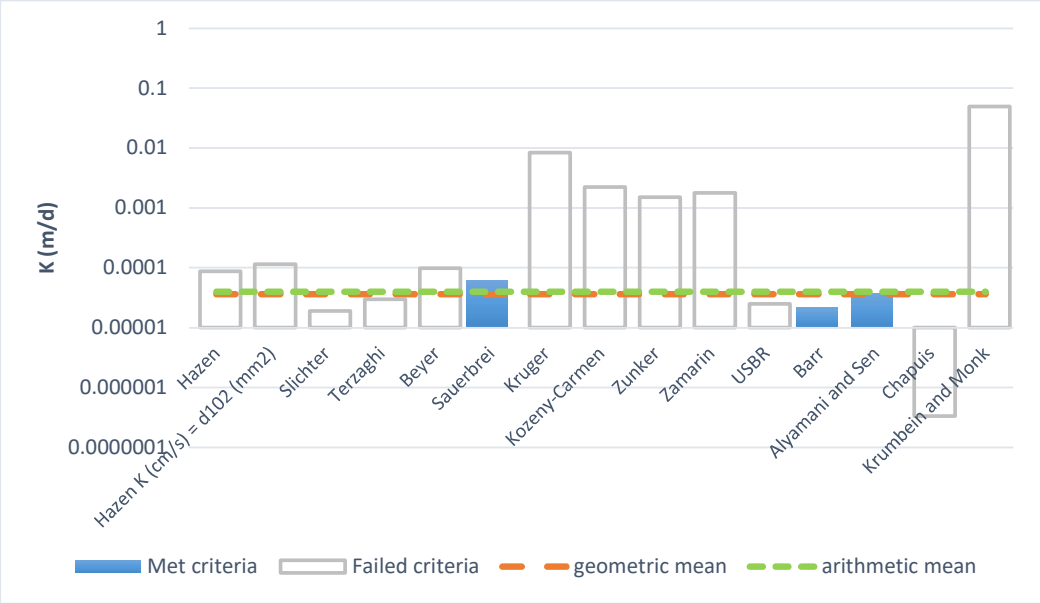
Date: 19-Jun-24

Sample Name: BH102-SS15

Mass Sample (g): 100

T (oC) 20

Poorly sorted clay with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	1.0E-07	1.0E-09	0.00	
Hazen K (cm/s) = d_{10} (mm)	1.3E-07	1.3E-09	0.00	
Slichter	2.2E-08	2.2E-10	0.00	
Terzaghi	3.4E-08	3.4E-10	0.00	
Beyer	1.1E-07	1.1E-09	0.00	
Sauerbrei	7.0E-08	7.0E-10	0.00	
Kruger	9.7E-06	9.7E-08	0.01	
Kozeny-Carmen	2.6E-06	2.6E-08	0.00	
Zunker	1.7E-06	1.7E-08	0.00	
Zamarin	2.1E-06	2.1E-08	0.00	
USBR	2.9E-08	2.9E-10	0.00	
Barr	2.5E-08	2.5E-10	0.00	
Alyamani and Sen	4.3E-08	4.3E-10	0.00	
Chapuis	3.8E-10	3.8E-12	0.00	
Krumbein and Monk	5.7E-05	5.7E-07	0.05	
geometric mean	4.2E-08	4.2E-10	0.00	
arithmetic mean	4.6E-08	4.6E-10	0.00	

K from Grain Size Analysis Report

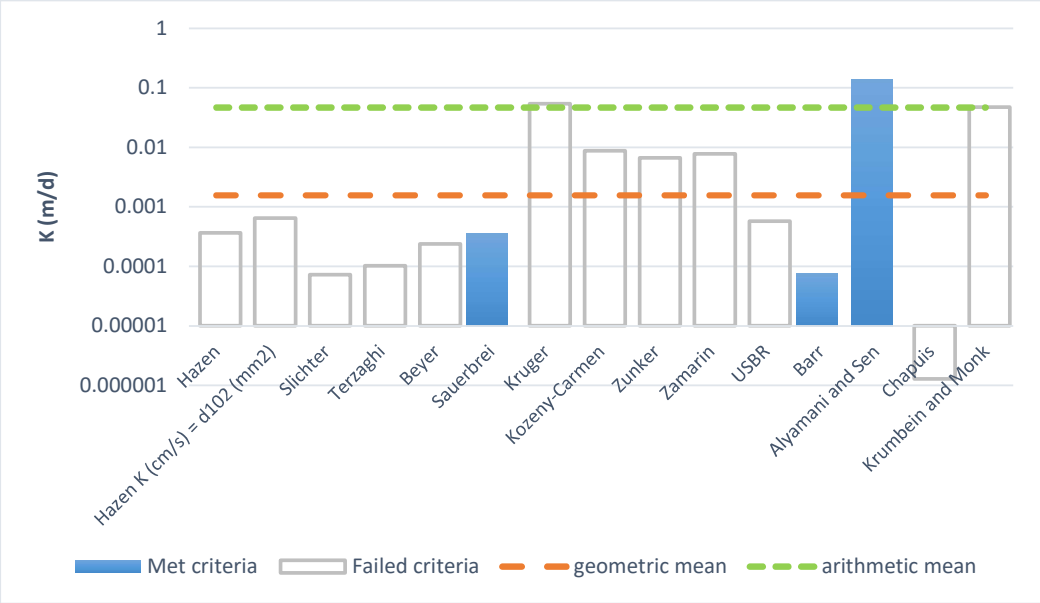
Date: 19-Jun-24

Sample Name: BH103-SS6

Mass Sample (g): 100

T (oC) 20

Poorly sorted sandy silt with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	4.2E-07	4.2E-09	0.00	
Hazen K (cm/s) = d_{10} (mm)	7.5E-07	7.5E-09	0.00	
Slichter	8.3E-08	8.3E-10	0.00	
Terzaghi	1.2E-07	1.2E-09	0.00	
Beyer	2.8E-07	2.8E-09	0.00	
Sauerbrei	4.1E-07	4.1E-09	0.00	
Kruger	6.3E-05	6.3E-07	0.05	
Kozeny-Carmen	1.0E-05	1.0E-07	0.01	
Zunker	7.7E-06	7.7E-08	0.01	
Zamarin	9.0E-06	9.0E-08	0.01	
USBR	6.6E-07	6.6E-09	0.00	
Barr	8.9E-08	8.9E-10	0.00	
Alyamani and Sen	1.6E-04	1.6E-06	0.14	
Chapuis	1.5E-09	1.5E-11	0.00	
Krumbein and Monk	5.5E-05	5.5E-07	0.05	
geometric mean	1.8E-06	1.8E-08	0.00	
arithmetic mean	5.4E-05	5.4E-07	0.05	

K from Grain Size Analysis Report

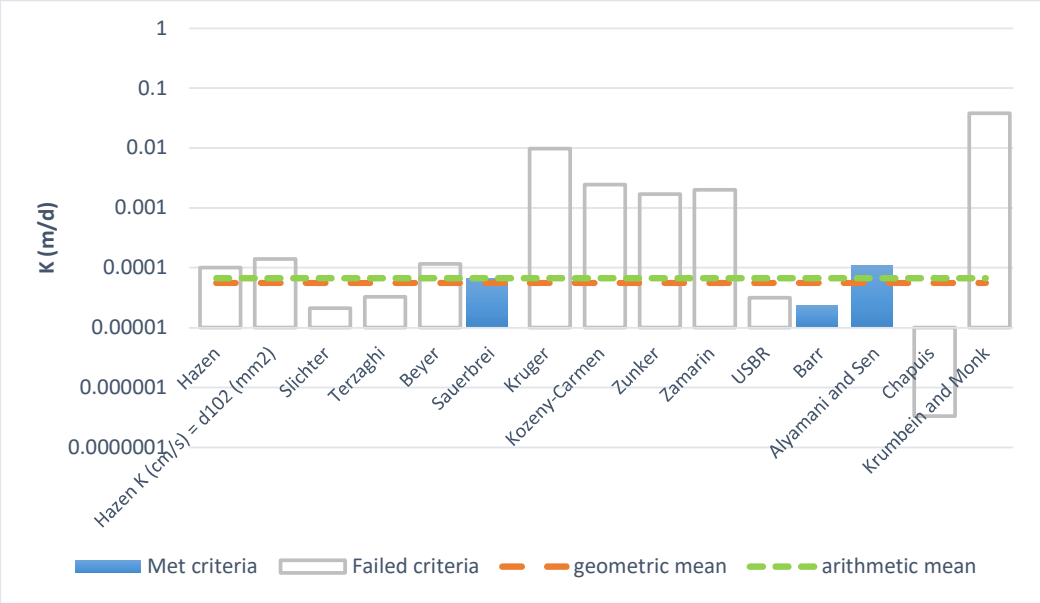
Date: 19-Jun-24

Sample Name: BH104-SS7

Mass Sample (g): 100

T (oC) 20

Poorly sorted clay with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	1.2E-07	1.2E-09	0.00	
Hazen K (cm/s) = d_{10} (mm)	1.6E-07	1.6E-09	0.00	
Slichter	2.5E-08	2.5E-10	0.00	
Terzaghi	3.8E-08	3.8E-10	0.00	
Beyer	1.3E-07	1.3E-09	0.00	
Sauerbrei	7.8E-08	7.8E-10	0.00	
Kruger	1.1E-05	1.1E-07	0.01	
Kozeny-Carmen	2.8E-06	2.8E-08	0.00	
Zunker	2.0E-06	2.0E-08	0.00	
Zamarin	2.3E-06	2.3E-08	0.00	
USBR	3.7E-08	3.7E-10	0.00	
Barr	2.7E-08	2.7E-10	0.00	
Alyamani and Sen	1.3E-07	1.3E-09	0.00	
Chapuis	3.9E-10	3.9E-12	0.00	
Krumbein and Monk	4.4E-05	4.4E-07	0.04	
geometric mean	6.5E-08	6.5E-10	0.00	
arithmetic mean	7.8E-08	7.8E-10	0.00	

APPENDIX E

Your Project #: 24-076
Site Location: 45 GRENOBLE DR.
Your C.O.C. #: C#994088-01-01

Attention: Andrew Kernerman

Grounded Engineering Inc.
1 Banigan Drive
Toronto, ON
CANADA M4H 1G3

Report Date: 2024/06/14
Report #: R8191491
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C4H0986
Received: 2024/06/06, 16:00

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Sewer Use By-Law Semivolatile Organics	1	2024/06/09	2024/06/10	CAM SOP 00301	EPA 8270 m
Biochemical Oxygen Demand (BOD)	1	2024/06/08	2024/06/13	CAM SOP-00427	SM 24 5210B m
Chromium (VI) in Water	1	N/A	2024/06/07	CAM SOP-00436	EPA 7199 m
Total Cyanide	1	2024/06/07	2024/06/07	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2024/06/07	2024/06/08	CAM SOP-00449	SM 24 4500-F C m
Mercury in Water by CVAA	1	2024/06/11	2024/06/11	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS	1	2024/06/11	2024/06/13	CAM SOP-00447	EPA 6020B m
E.coli, (CFU/100mL)	1	N/A	2024/06/06	CAM SOP-00552	SM9222B, MECP E3371
Total Nonylphenol in Liquids by HPLC	1	2024/06/07	2024/06/10	CAM SOP-00313	In-house Method
Nonylphenol Ethoxylates in Liquids: HPLC	1	2024/06/07	2024/06/10	CAM SOP-00313	In-house Method
Animal and Vegetable Oil and Grease	1	N/A	2024/06/13	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2024/06/12	2024/06/12	CAM SOP-00326	EPA1664B m,SM5520B m
Polychlorinated Biphenyl in Water	1	2024/06/11	2024/06/12	CAM SOP-00309	EPA 8082A m
Phenols (4AAP)	1	N/A	2024/06/10	CAM SOP-00444	OMOE E3179 m
pH	1	2024/06/07	2024/06/08	CAM SOP-00413	SM 24th-4500H+ B
Total Kjeldahl Nitrogen in Water	1	2024/06/11	2024/06/12	CAM SOP-00938	OMOE E3516 m
Total PAHs (1)	1	N/A	2024/06/10	CAM SOP - 00301	
Mineral/Synthetic O & G (TPH Heavy Oil) (2)	1	2024/06/12	2024/06/12	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2024/06/11	2024/06/12	CAM SOP-00428	SM 24 2540D m
Volatile Organic Compounds in Water	1	N/A	2024/06/10	CAM SOP-00228	EPA 8260D

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, EPA, APHA or the Quebec Ministry of Environment.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or

Your Project #: 24-076
Site Location: 45 GRENOBLE DR.
Your C.O.C. #: C#994088-01-01

Attention: Andrew Kernerman

Grounded Engineering Inc.
1 Banigan Drive
Toronto, ON
CANADA M4H 1G3

Report Date: 2024/06/14
Report #: R8191491
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C4H0986
Received: 2024/06/06, 16:00

implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Total PAHs include only those PAHs specified in the sewer use by-by-law.
(2) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Marijane Cruz, Senior Project Manager
Email: Marijane.Cruz@bureauveritas.com
Phone# (905)817-5756

==========

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas Job #: C4H0986
Report Date: 2024/06/14

Grounded Engineering Inc.
Client Project #: 24-076
Site Location: 45 GRENOBLE DR.
Sampler Initials: DB

TORONTO SANITARY&STORM SEWER (100-2016)

Bureau Veritas ID				ZJM145			
Sampling Date				2024/06/06 14:00			
COC Number				C#994088-01-01			
	UNITS	Criteria	Criteria-2	SW-UF-BH102I	RDL	MDL	QC Batch
Calculated Parameters							
Total Animal/Vegetable Oil and Grease	mg/L	-	150	<0.50	0.50	0.10	9437536
Inorganics							
Total BOD	mg/L	15	300	<2	2	0.5	9442869
Fluoride (F-)	mg/L	-	10	0.12	0.10	0.014	9442400
Total Kjeldahl Nitrogen (TKN)	mg/L	-	100	0.92	0.20	0.12	9447765
pH	pH	6.0:9.5	6.0:11.5	7.62			9442396
Phenols-4AAP	mg/L	0.008	1.0	<0.0010	0.0010	0.00040	9444447
Total Suspended Solids	mg/L	15	350	**69**	10	9.6	9447391
Total Cyanide (CN)	mg/L	0.02	2	<0.0050	0.0050	0.00028	9441145
Petroleum Hydrocarbons							
Total Oil & Grease	mg/L	-	-	1.6	0.50	0.10	9451043
Total Oil & Grease Mineral/Synthetic	mg/L	-	15	1.2	0.50	0.10	9451052
Miscellaneous Parameters							
Nonylphenol Ethoxylate (Total)	mg/L	0.01	0.2	<0.005	0.005	N/A	9440112
Nonylphenol (Total)	mg/L	0.001	0.02	<0.001	0.001	0.0002	9440104
Metals							
Chromium (VI)	mg/L	0.04	2	<0.00050	0.00050	0.00030	9434695
Mercury (Hg)	mg/L	0.0004	0.01	<0.00010	0.00010	0.000050	9447506
Total Aluminum (Al)	mg/L	-	50	1.3	0.025	0.010	9446490
Total Antimony (Sb)	mg/L	-	5	<0.00050	0.00050	0.00030	9446490
Total Arsenic (As)	mg/L	0.02	1	<0.0010	0.0010	0.00050	9446490
Total Cadmium (Cd)	mg/L	0.008	0.7	0.00019	0.000090	0.000090	9446490
Total Chromium (Cr)	mg/L	0.08	4	<0.0050	0.0050	0.0050	9446490
Total Cobalt (Co)	mg/L	-	5	0.0020	0.00050	0.00010	9446490
Total Copper (Cu)	mg/L	0.04	2	0.0049	0.00090	0.00050	9446490
Total Lead (Pb)	mg/L	0.12	1	0.0014	0.00050	0.00010	9446490
Total Manganese (Mn)	mg/L	0.05	5	**0.31**	0.0020	0.00050	9446490
Total Molybdenum (Mo)	mg/L	-	5	0.0017	0.00050	0.00020	9446490

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Toronto Storm Sewer Discharge Use By-Law
Criteria-2: Toronto Sanitary and Combined Sewers Discharge Guidelines. Referenced to the Chapter 681.
N/A = Not Applicable

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

TORONTO SANITARY&STORM SEWER (100-2016)

Bureau Veritas ID				ZJM145			
Sampling Date				2024/06/06 14:00			
COC Number				C#994088-01-01			
	UNITS	Criteria	Criteria-2	SW-UF-BH102I	RDL	MDL	QC Batch
Total Nickel (Ni)	mg/L	0.08	2	0.0035	0.0010	0.00050	9446490
Total Phosphorus (P)	mg/L	0.4	10	<0.10	0.10	0.030	9446490
Total Selenium (Se)	mg/L	0.02	1	<0.0020	0.0020	0.00050	9446490
Total Silver (Ag)	mg/L	0.12	5	<0.000090	0.000090	0.000070	9446490
Total Tin (Sn)	mg/L	-	5	0.0026	0.0010	0.00050	9446490
Total Titanium (Ti)	mg/L	-	5	0.069	0.0050	0.0040	9446490
Total Zinc (Zn)	mg/L	0.04	2	0.022	0.0050	0.0030	9446490
Semivolatile Organics							
Di-N-butyl phthalate	mg/L	0.015	0.08	<0.008	0.008	0.002	9443678
Bis(2-ethylhexyl)phthalate	mg/L	0.0088	0.012	<0.008	0.008	0.002	9443678
3,3'-Dichlorobenzidine	mg/L	0.0008	0.002	<0.0008	0.0008	0.0002	9443678
Pentachlorophenol	mg/L	0.002	0.005	<0.002	0.002	0.0004	9443678
Phenanthrene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Anthracene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Fluoranthene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Pyrene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Benzo(a)anthracene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Chrysene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Benzo(b/j)fluoranthene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Benzo(k)fluoranthene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Benzo(a)pyrene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Indeno(1,2,3-cd)pyrene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Dibenzo(a,h)anthracene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Benzo(g,h,i)perylene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Dibenzo(a,i)pyrene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Benzo(e)pyrene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Perylene	mg/L	-	-	<0.0008	0.0008	0.0004	9443678
Dibenzo(a,j) acridine	mg/L	-	-	<0.002	0.002	0.0005	9443678
7H-Dibenzo(c,g) Carbazole	mg/L	-	-	<0.002	0.002	0.0005	9443678
1,6-Dinitropyrene	mg/L	-	-	<0.002	0.002	0.0005	9443678

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Toronto Storm Sewer Discharge Use By-Law
Criteria-2: Toronto Sanitary and Combined Sewers Discharge Guidelines. Referenced to the Chapter 681.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

TORONTO SANITARY&STORM SEWER (100-2016)

Bureau Veritas ID				ZJM145			
Sampling Date				2024/06/06 14:00			
COC Number				C#994088-01-01			
	UNITS	Criteria	Criteria-2	SW-UF-BH102I	RDL	MDL	QC Batch
1,3-Dinitropyrene	mg/L	-	-	<0.002	0.002	0.0005	9443678
1,8-Dinitropyrene	mg/L	-	-	<0.002	0.002	0.0005	9443678
Calculated Parameters							
Total PAHs (18 PAHs)	mg/L	0.002	0.005	**<0.005 (1)**	0.005	0.001	9439547
Volatile Organics							
Benzene	mg/L	0.002	0.01	<0.00020	0.00020	0.000020	9440923
Chloroform	mg/L	0.002	0.04	<0.00020	0.00020	0.000050	9440923
1,2-Dichlorobenzene	mg/L	0.0056	0.05	<0.00040	0.00040	0.000050	9440923
1,4-Dichlorobenzene	mg/L	0.0068	0.08	<0.00040	0.00040	0.000050	9440923
cis-1,2-Dichloroethylene	mg/L	0.0056	4	<0.00050	0.00050	0.000050	9440923
trans-1,3-Dichloropropene	mg/L	0.0056	0.14	<0.00040	0.00040	0.000050	9440923
Ethylbenzene	mg/L	0.002	0.16	<0.00020	0.00020	0.000010	9440923
Methylene Chloride(Dichloromethane)	mg/L	0.0052	2	<0.0020	0.0020	0.00010	9440923
1,1,2,2-Tetrachloroethane	mg/L	0.017	1.4	<0.00040	0.00040	0.000050	9440923
Tetrachloroethylene	mg/L	0.0044	1	<0.00020	0.00020	0.000050	9440923
Toluene	mg/L	0.002	0.016	<0.00020	0.00020	0.000010	9440923
Trichloroethylene	mg/L	0.0076	0.4	<0.00020	0.00020	0.000050	9440923
p+m-Xylene	mg/L	-	-	<0.00020	0.00020	0.000010	9440923
o-Xylene	mg/L	-	-	<0.00020	0.00020	0.000010	9440923
Total Xylenes	mg/L	0.0044	1.4	<0.00020	0.00020	0.000010	9440923
PCBs							
Total PCB	mg/L	0.0004	0.001	<0.00005	0.00005	0.00001	9447961
Microbiological							
Escherichia coli	CFU/100mL	200	-	<10	10	N/A	9439652
Surrogate Recovery (%)							
2,4,6-Tribromophenol	%	-	-	59			9443678
2-Fluorobiphenyl	%	-	-	64			9443678
D14-Terphenyl (FS)	%	-	-	102			9443678

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Toronto Storm Sewer Discharge Use By-Law
Criteria-2: Toronto Sanitary and Combined Sewers Discharge Guidelines. Referenced to the Chapter 681.
N/A = Not Applicable
(1) RDL exceeds criteria

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TORONTO SANITARY&STORM SEWER (100-2016)

Bureau Veritas ID				ZJM145			
Sampling Date				2024/06/06 14:00			
COC Number				C#994088-01-01			
	UNITS	Criteria	Criteria-2	SW-UF-BH102I	RDL	MDL	QC Batch
D5-Nitrobenzene	%	-	-	63			9443678
D8-Acenaphthylene	%	-	-	72			9443678
Decachlorobiphenyl	%	-	-	82			9447961
4-Bromofluorobenzene	%	-	-	100			9440923
D4-1,2-Dichloroethane	%	-	-	112			9440923
D8-Toluene	%	-	-	96			9440923

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Toronto Storm Sewer Discharge Use By-Law
Criteria-2: Toronto Sanitary and Combined Sewers Discharge Guidelines. Referenced to the Chapter 681.

Bureau Veritas ID				ZJM145			
Sampling Date				2024/06/06 14:00			
COC Number				C#994088-01-01			
	UNITS	Criteria	Criteria-2	SW-UF-BH102I Lab-Dup	RDL	MDL	QC Batch
Inorganics							
Fluoride (F-)	mg/L	-	10	0.10	0.10	0.014	9442400
pH	pH	6.0:9.5	6.0:11.5	7.78			9442396

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Toronto Storm Sewer Discharge Use By-Law
Criteria-2: Toronto Sanitary and Combined Sewers Discharge Guidelines. Referenced to the Chapter 681.

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Bureau Veritas Job #: C4H0986
Report Date: 2024/06/14

Grounded Engineering Inc.
Client Project #: 24-076
Site Location: 45 GRENOBLE DR.
Sampler Initials: DB

TEST SUMMARY

Bureau Veritas ID: ZJM145
Sample ID: SW-UF-BH102I
Matrix: Water

Collected: 2024/06/06
Shipped:
Received: 2024/06/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sewer Use By-Law Semivolatile Organics	GC/MS	9443678	2024/06/09	2024/06/10	Ahmed Ismail
Biochemical Oxygen Demand (BOD)	DO	9442869	2024/06/08	2024/06/13	Amrutha Anilkumar
Chromium (VI) in Water	IC	9434695	N/A	2024/06/07	Surleen Kaur Romana
Total Cyanide	SKAL/CN	9441145	2024/06/07	2024/06/07	Prgya Panchal
Fluoride	ISE	9442400	2024/06/07	2024/06/08	Nachiketa Gohil
Mercury in Water by CVAA	CV/AA	9447506	2024/06/11	2024/06/11	Gagandeep Rai
Total Metals Analysis by ICPMS	ICP/MS	9446490	2024/06/11	2024/06/13	Arefa Dabhad
E.coli, (CFU/100mL)	PL	9439652	N/A	2024/06/06	Jessica (Ya Ping) Qiang
Total Nonylphenol in Liquids by HPLC	LC/FLU	9440104	2024/06/07	2024/06/10	Furneesh Kumar
Nonylphenol Ethoxylates in Liquids: HPLC	LC/FLU	9440112	2024/06/07	2024/06/10	Furneesh Kumar
Animal and Vegetable Oil and Grease	BAL	9437536	N/A	2024/06/13	Automated Statchk
Total Oil and Grease	BAL	9451043	2024/06/12	2024/06/12	Ajaykumar Sharma
Polychlorinated Biphenyl in Water	GC/ECD	9447961	2024/06/11	2024/06/12	Svitlana Shaula
Phenols (4AAP)	TECH/PHEN	9444447	N/A	2024/06/10	Chloe Pollock
pH	AT	9442396	2024/06/07	2024/06/08	Nachiketa Gohil
Total Kjeldahl Nitrogen in Water	SKAL	9447765	2024/06/11	2024/06/12	Kruti Jitesh Patel
Total PAHs	CALC	9439547	N/A	2024/06/10	Automated Statchk
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	9451052	2024/06/12	2024/06/12	Ajaykumar Sharma
Total Suspended Solids	BAL	9447391	2024/06/11	2024/06/12	Razieh Tabesh
Volatile Organic Compounds in Water	GC/MS	9440923	N/A	2024/06/10	Mariia Biliaieva

Bureau Veritas ID: ZJM145 Dup
Sample ID: SW-UF-BH102I
Matrix: Water

Collected: 2024/06/06
Shipped:
Received: 2024/06/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Fluoride	ISE	9442400	2024/06/07	2024/06/08	Nachiketa Gohil
pH	AT	9442396	2024/06/07	2024/06/08	Nachiketa Gohil

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	15.3°C

Cooler custody seal present and intact.

Sample ZJM145 [SW-UF-BH102I] : ABN-SEWER Analysis: Due to the sample matrix, a smaller amount was used for analysis. Detection limits were adjusted accordingly.

Results relate only to the items tested.

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Bureau Veritas Job #: C4H0986
Report Date: 2024/06/14

QUALITY ASSURANCE REPORT

Grounded Engineering Inc.
Client Project #: 24-076
Site Location: 45 GRENOBLE DR.
Sampler Initials: DB

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9440923	4-Bromofluorobenzene	2024/06/10	101	70 - 130	102	70 - 130	100	%				
9440923	D4-1,2-Dichloroethane	2024/06/10	109	70 - 130	108	70 - 130	109	%				
9440923	D8-Toluene	2024/06/10	99	70 - 130	98	70 - 130	97	%				
9443678	2,4,6-Tribromophenol	2024/06/09	96	10 - 130	96	10 - 130	78	%				
9443678	2-Fluorobiphenyl	2024/06/09	89	30 - 130	76	30 - 130	63	%				
9443678	D14-Terphenyl (FS)	2024/06/09	107	30 - 130	104	30 - 130	104	%				
9443678	D5-Nitrobenzene	2024/06/09	89	30 - 130	91	30 - 130	81	%				
9443678	D8-Acenaphthylene	2024/06/09	87	30 - 130	82	30 - 130	74	%				
9447961	Decachlorobiphenyl	2024/06/12	98	60 - 130	88	60 - 130	90	%				
9434695	Chromium (VI)	2024/06/07	102	80 - 120	101	80 - 120	<0.00050	mg/L	0.20	20		
9440104	Nonylphenol (Total)	2024/06/09	97	50 - 130	101	50 - 130	<0.001	mg/L	NC	40		
9440112	Nonylphenol Ethoxylate (Total)	2024/06/09	91	50 - 130	104	50 - 130	<0.005	mg/L	NC	40		
9440923	1,1,2,2-Tetrachloroethane	2024/06/10	110	70 - 130	109	70 - 130	<0.00040	mg/L	NC	30		
9440923	1,2-Dichlorobenzene	2024/06/10	100	70 - 130	97	70 - 130	<0.00040	mg/L	NC	30		
9440923	1,4-Dichlorobenzene	2024/06/10	94	70 - 130	94	70 - 130	<0.00040	mg/L	NC	30		
9440923	Benzene	2024/06/10	100	70 - 130	100	70 - 130	<0.00020	mg/L	NC	30		
9440923	Chloroform	2024/06/10	103	70 - 130	103	70 - 130	<0.00020	mg/L	NC	30		
9440923	cis-1,2-Dichloroethylene	2024/06/10	103	70 - 130	102	70 - 130	<0.00050	mg/L	NC	30		
9440923	Ethylbenzene	2024/06/10	98	70 - 130	97	70 - 130	<0.00020	mg/L	NC	30		
9440923	Methylene Chloride(Dichloromethane)	2024/06/10	108	70 - 130	107	70 - 130	<0.0020	mg/L	NC	30		
9440923	o-Xylene	2024/06/10	97	70 - 130	97	70 - 130	<0.00020	mg/L	NC	30		
9440923	p+m-Xylene	2024/06/10	97	70 - 130	96	70 - 130	<0.00020	mg/L	NC	30		
9440923	Tetrachloroethylene	2024/06/10	99	70 - 130	98	70 - 130	<0.00020	mg/L	NC	30		
9440923	Toluene	2024/06/10	96	70 - 130	96	70 - 130	<0.00020	mg/L	NC	30		
9440923	Total Xylenes	2024/06/10					<0.00020	mg/L	NC	30		
9440923	trans-1,3-Dichloropropene	2024/06/10	109	70 - 130	100	70 - 130	<0.00040	mg/L	NC	30		
9440923	Trichloroethylene	2024/06/10	101	70 - 130	101	70 - 130	<0.00020	mg/L	NC	30		
9441145	Total Cyanide (CN)	2024/06/07	97	80 - 120	100	80 - 120	<0.0050	mg/L	NC	20		
9442396	pH	2024/06/08			102	98 - 103			2.2	N/A		
9442400	Fluoride (F-)	2024/06/08	100	80 - 120	100	80 - 120	<0.10	mg/L	20	20		
9442869	Total BOD	2024/06/13					<2	mg/L	NC	30	98	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9443678	1,3-Dinitropyrene	2024/06/09	113	30 - 130	124	30 - 130	<0.0004	mg/L	NC	40		
9443678	1,6-Dinitropyrene	2024/06/09	99	30 - 130	110	30 - 130	<0.0004	mg/L	NC	40		
9443678	1,8-Dinitropyrene	2024/06/09	78	30 - 130	90	30 - 130	<0.0004	mg/L	NC	40		
9443678	3,3'-Dichlorobenzidine	2024/06/09	101	30 - 130	99	30 - 130	<0.0008	mg/L	NC	40		
9443678	7H-Dibenzo(c,g) Carbazole	2024/06/09	73	30 - 130	90	30 - 130	<0.0004	mg/L	NC	40		
9443678	Anthracene	2024/06/09	113	30 - 130	111	30 - 130	<0.0002	mg/L	NC	40		
9443678	Benzo(a)anthracene	2024/06/09	111	30 - 130	107	30 - 130	<0.0002	mg/L	NC	40		
9443678	Benzo(a)pyrene	2024/06/09	127	30 - 130	126	30 - 130	<0.0002	mg/L	NC	40		
9443678	Benzo(b/j)fluoranthene	2024/06/09	120	30 - 130	116	30 - 130	<0.0002	mg/L	NC	40		
9443678	Benzo(e)pyrene	2024/06/09	120	30 - 130	118	30 - 130	<0.0002	mg/L	NC	40		
9443678	Benzo(g,h,i)perylene	2024/06/09	105	30 - 130	125	30 - 130	<0.0002	mg/L	NC	40		
9443678	Benzo(k)fluoranthene	2024/06/09	122	30 - 130	109	30 - 130	<0.0002	mg/L	NC	40		
9443678	Bis(2-ethylhexyl)phthalate	2024/06/09	109	30 - 130	106	30 - 130	<0.002	mg/L	NC	40		
9443678	Chrysene	2024/06/09	120	30 - 130	118	30 - 130	<0.0002	mg/L	NC	40		
9443678	Dibenzo(a,h)anthracene	2024/06/09	98	30 - 130	115	30 - 130	<0.0002	mg/L	NC	40		
9443678	Dibenzo(a,i)pyrene	2024/06/09	99	30 - 130	62	30 - 130	<0.0002	mg/L	NC	40		
9443678	Dibenzo(a,j) acridine	2024/06/09	87	30 - 130	102	30 - 130	<0.0004	mg/L	NC	40		
9443678	Di-N-butyl phthalate	2024/06/09	109	30 - 130	99	30 - 130	<0.002	mg/L	NC	40		
9443678	Fluoranthene	2024/06/09	124	30 - 130	121	30 - 130	<0.0002	mg/L	NC	40		
9443678	Indeno(1,2,3-cd)pyrene	2024/06/09	92	30 - 130	108	30 - 130	<0.0002	mg/L	NC	40		
9443678	Pentachlorophenol	2024/06/09	56	30 - 130	62	30 - 130	<0.001	mg/L	NC	40		
9443678	Perylene	2024/06/09	98	30 - 130	118	30 - 130	<0.0002	mg/L	NC	40		
9443678	Phenanthrene	2024/06/09	110	30 - 130	110	30 - 130	<0.0002	mg/L	NC	40		
9443678	Pyrene	2024/06/09	123	30 - 130	120	30 - 130	<0.0002	mg/L	NC	40		
9444447	Phenols-4AAP	2024/06/10	102	80 - 120	102	80 - 120	<0.0010	mg/L	NC	20		
9446490	Total Aluminum (Al)	2024/06/12	99	80 - 120	97	80 - 120	<0.0049	mg/L	5.8	20		
9446490	Total Antimony (Sb)	2024/06/12	108	80 - 120	104	80 - 120	<0.00050	mg/L				
9446490	Total Arsenic (As)	2024/06/12	102	80 - 120	99	80 - 120	<0.0010	mg/L				
9446490	Total Cadmium (Cd)	2024/06/12	99	80 - 120	97	80 - 120	<0.000090	mg/L	NC	20		
9446490	Total Chromium (Cr)	2024/06/12	95	80 - 120	93	80 - 120	<0.0050	mg/L	NC	20		
9446490	Total Cobalt (Co)	2024/06/12	101	80 - 120	96	80 - 120	<0.00050	mg/L				

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9446490	Total Copper (Cu)	2024/06/12	100	80 - 120	96	80 - 120	<0.00090	mg/L	2.2	20		
9446490	Total Lead (Pb)	2024/06/12	101	80 - 120	98	80 - 120	<0.00050	mg/L	0.88	20		
9446490	Total Manganese (Mn)	2024/06/12	95	80 - 120	94	80 - 120	<0.0020	mg/L				
9446490	Total Molybdenum (Mo)	2024/06/12	102	80 - 120	97	80 - 120	<0.00050	mg/L				
9446490	Total Nickel (Ni)	2024/06/12	96	80 - 120	93	80 - 120	<0.0010	mg/L	3.9	20		
9446490	Total Phosphorus (P)	2024/06/12	NC	80 - 120	96	80 - 120	<0.10	mg/L				
9446490	Total Selenium (Se)	2024/06/12	101	80 - 120	102	80 - 120	<0.0020	mg/L				
9446490	Total Silver (Ag)	2024/06/12	95	80 - 120	93	80 - 120	<0.000090	mg/L				
9446490	Total Tin (Sn)	2024/06/12	104	80 - 120	98	80 - 120	<0.0010	mg/L				
9446490	Total Titanium (Ti)	2024/06/12	98	80 - 120	96	80 - 120	<0.0050	mg/L				
9446490	Total Zinc (Zn)	2024/06/12	98	80 - 120	97	80 - 120	<0.0050	mg/L	15	20		
9447391	Total Suspended Solids	2024/06/12			101	80 - 120	<10	mg/L	4.9	20		
9447506	Mercury (Hg)	2024/06/11	104	75 - 125	93	80 - 120	<0.00010	mg/L	NC	20		
9447765	Total Kjeldahl Nitrogen (TKN)	2024/06/12	NC	80 - 120	95	80 - 120	<0.10	mg/L	0.41	20	97	80 - 120
9447961	Total PCB	2024/06/12	99	60 - 130	84	60 - 130	<0.00005	mg/L	NC	40		
9451043	Total Oil & Grease	2024/06/12			99	80 - 110	<0.50	mg/L	0.51	25		
9451052	Total Oil & Grease Mineral/Synthetic	2024/06/12			96	65 - 130	<0.50	mg/L	2.1	25		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Bureau Veritas Job #: C4H0986
Report Date: 2024/06/14

Grounded Engineering Inc.
Client Project #: 24-076
Site Location: 45 GRENOBLE DR.
Sampler Initials: DB

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Cristina Carriere, Senior Scientific Specialist

Jessica (Ya Ping) Qiang, Analyst II

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

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MICRO

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C

NONT-2024-06-421

Page 1 of 1

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:			
Company Name:	#36876 Grounded Engineering Inc.	Company Name:		Quotation #:	C35487	Bottle Order #:	994088
Attention:	Andrew Kernerman	Attention:	Andrew Kernerman	P.O. #:			
Address:	1 Banigan Drive Toronto ON M4H 1G3	Address:		Project:	24-076		
Tel:	(647) 264-7909 Fax:	Tel:	Fax:	Project Name:	45 Greenoble dr.	COC #: C#994088-01-01	Project Manager: Marijane Cruz
Email:	akernerman@groundedeng.ca	Email:	akernerman@groundedeng.ca	Site #:			
				Sampled By:	Dhruv Bhagat		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)
- ☐ Table 1 ☐ Res/Park ☐ Medium/Fine
- ☐ Table 2 ☐ Ind/Comm ☐ Coarse
- ☐ Table 3 ☐ Agri/Other ☐ For RSC
- ☐ Table ___

Other Regulations
- ☐ CCME ☑ Sanitary Sewer Bylaw
- ☐ Reg 558 ☑ Storm Sewer Bylaw
- ☐ MISA Municipality TORONTO
- ☐ PWQO ☐ Reg 406 Table
- ☐ Other

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? Y

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT:
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	Toronto Sanitary&Storm Sewer (100-2016)									# of Bottles	Comments
1		SW - UF - BH102 I	616124	1400	GW	N	X									18	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only			
Dhruv Bhagat	24/06/06	1500	[illegible]	2024/06/06	16:00		Time Sensitive	Temperature (°C) on Recei 15/16/15	Custody Seal Present ✓ / Intact	Yes ✓ / No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS. 876689

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/CHAIN-CUSTODY-FORMS-COCS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

Bureau Veritas Job #: C4H0986
Report Date: 2024/06/14

Grounded Engineering Inc.
Client Project #: 24-076
Site Location: 45 GRENOBLE DR.
Sampler Initials: DB

Exceedance Summary Table – Toronto Storm Sewer

Result Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
SW-UF-BH102I	ZJM145-08	Total Manganese (Mn)	0.05	0.31	0.0020	mg/L
SW-UF-BH102I	ZJM145-06	Total Suspended Solids	15	69	10	mg/L

Detection Limit Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
SW-UF-BH102I	ZJM145-01	Total PAHs (18 PAHs)	0.002	<0.005	0.005	mg/L

The exceedance summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

Exceedance Summary Table – Toronto Sanitary Sewer

Result Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
No Exceedances						

The exceedance summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

APPENDIX F

Material Name	Color	KS (m/s)
Fill		1e-06
Sand		1e-05
Clayey Silt		1e-09

Short Term Condition - Solider Pile and Lagging Shoring System

Excavation Dimensions: 65.0 m x 35.0 m
Section Cut: E-W

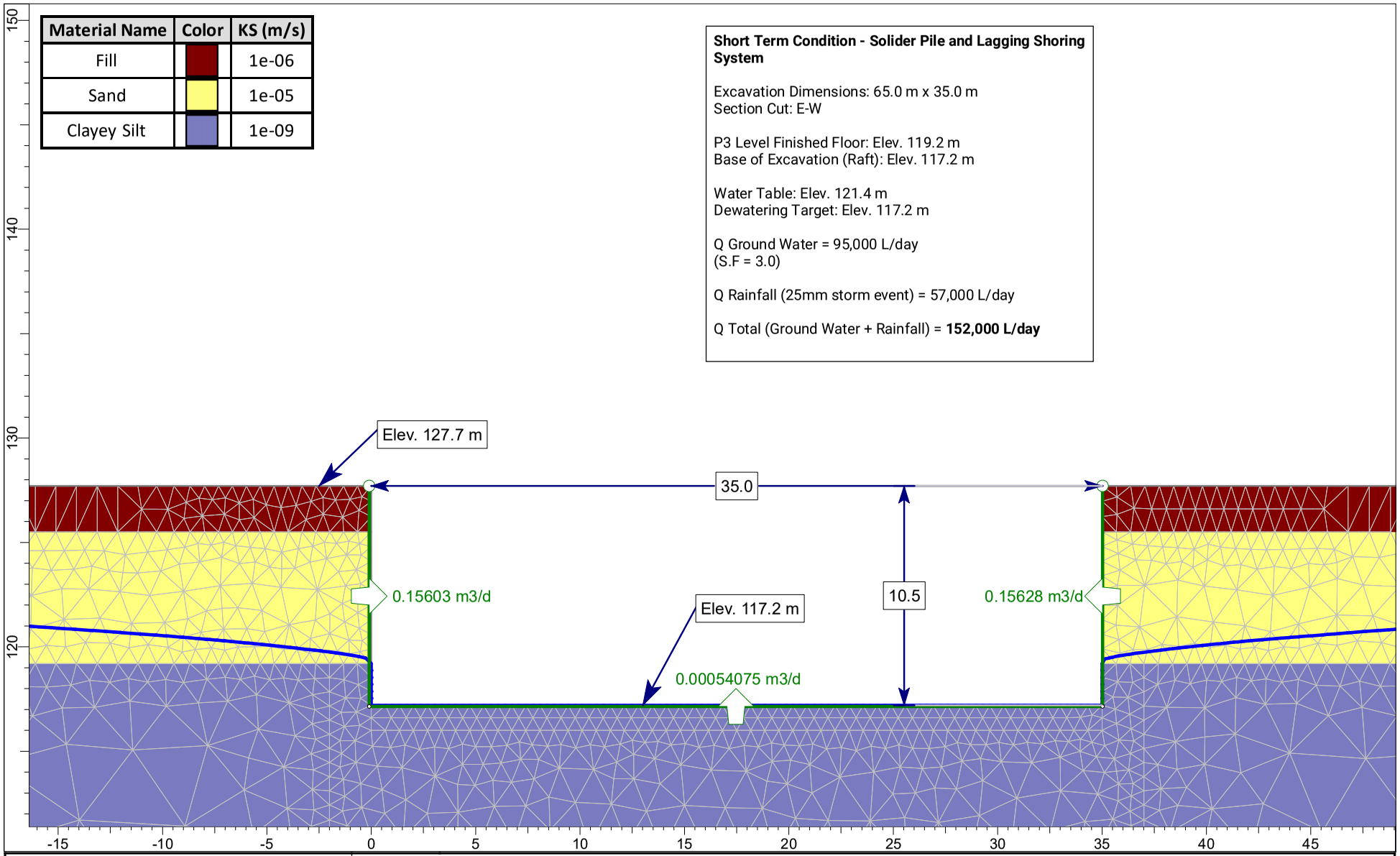
P3 Level Finished Floor: Elev. 119.2 m
Base of Excavation (Raft): Elev. 117.2 m

Water Table: Elev. 121.4 m
Dewatering Target: Elev. 117.2 m

Q Ground Water = 95,000 L/day
(S.F = 3.0)

Q Rainfall (25mm storm event) = 57,000 L/day

Q Total (Ground Water + Rainfall) = **152,000 L/day**



GROUNDED ENGINEERING

File	24-076 | 45 Grenoble Drive		
Analysis	Dewatering: Permeable Shoring - Soldier Pile & Lagging: Short Term, Master Scenario		
Ref.			
RS2 File	24-076 Dewatering Model.slmd	Scale 1:250	Eng AK

SLIDEINTERPRET 9.032

Material Name	Color	KS (m/s)
Fill		1e-06
Sand		1e-05
Clayey Silt		1e-09
Caisson Cut-Off Wall		1e-09

Short Term Condition - Caisson Shoring

Excavation Dimensions: 65.0 m x 35.0 m
Section Cut: E-W

P3 Level Finished Floor: Elev. 119.2 m
Base of Excavation (Raft): Elev. 117.2 m

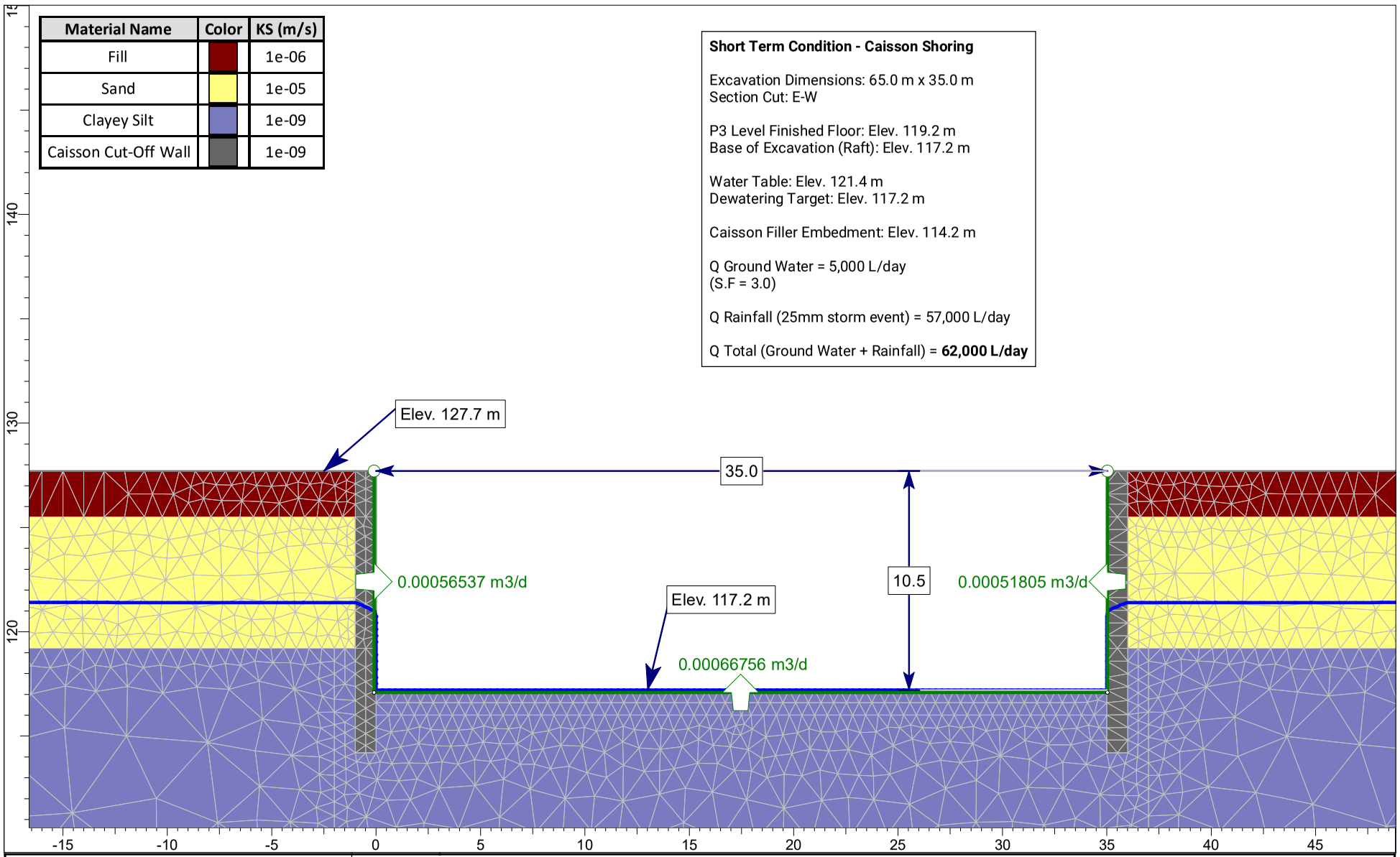
Water Table: Elev. 121.4 m
Dewatering Target: Elev. 117.2 m

Caisson Filler Embedment: Elev. 114.2 m

Q Ground Water = 5,000 L/day
(S.F = 3.0)

Q Rainfall (25mm storm event) = 57,000 L/day

Q Total (Ground Water + Rainfall) = **62,000 L/day**



GROUNDED ENGINEERING

File	**24-076 | 45 Grenoble Drive**			
Analysis	Dewatering: Impermeable Shoring - Caisson Wall: Short Term, Master Scenario			
Ref.				
RS2 File	24-076 Dewatering Model.slmd	Scale	1:250	Eng AK

SLIDEINTERPRET 9.032

APPENDIX G

SHORT TERM - Permeable (Soldier Pile & Lagging)

Excavation Dimensions [m]	
N-S	65
E-W	35
Area (m2)	2275
Perimeter (m)	200

Rainfall Data		
Year	2	100
Hour	3	12
Depth (mm)	25	94
Depth (m)	0.025	0.094

Section		Flow [m3/day]	Length [m]	Volume [L/day]
Base		0.00054075	65	35
Sides		0.15628	200	31,256
(extra row if sides are different)			0	-
Total				31,291
Factor of Safety	3.0			93,873

Storm Events	
2 Year [L/day]	100 Year [L/day]
56,875	214,000

Summary	L/day	L/min
Groundwater	95,000	66.0
Rainfall	57,000	39.6
Total	152,000	105.6

SHORT TERM - Impermeable (Caisson Wall)

Excavation Dimensions [m]	
N-S*	65
E-W*	35
Area (m2)	2275
Perimeter (m)	200

Rainfall Data		
Year	2	100
Hour	3	12
Depth (mm)	25	94
Depth (m)	0.025	0.094

* equivalent rectangle dimensions

Section		Flow [m3/day]	Length [m]	Volume [L/day]
Base		0.00066756	65	43
Sides		0.00056537	200	113
(extra row if sides are different)			0	-
Total				156
Factor of Safety	3.0			469

Storm Events	
2 Year [L/day]	100 Year [L/day]
56,875	214,000

Summary	L/day	L/min
Groundwater	5,000	3.5
Rainfall	57,000	39.6
Total	62,000	43.1