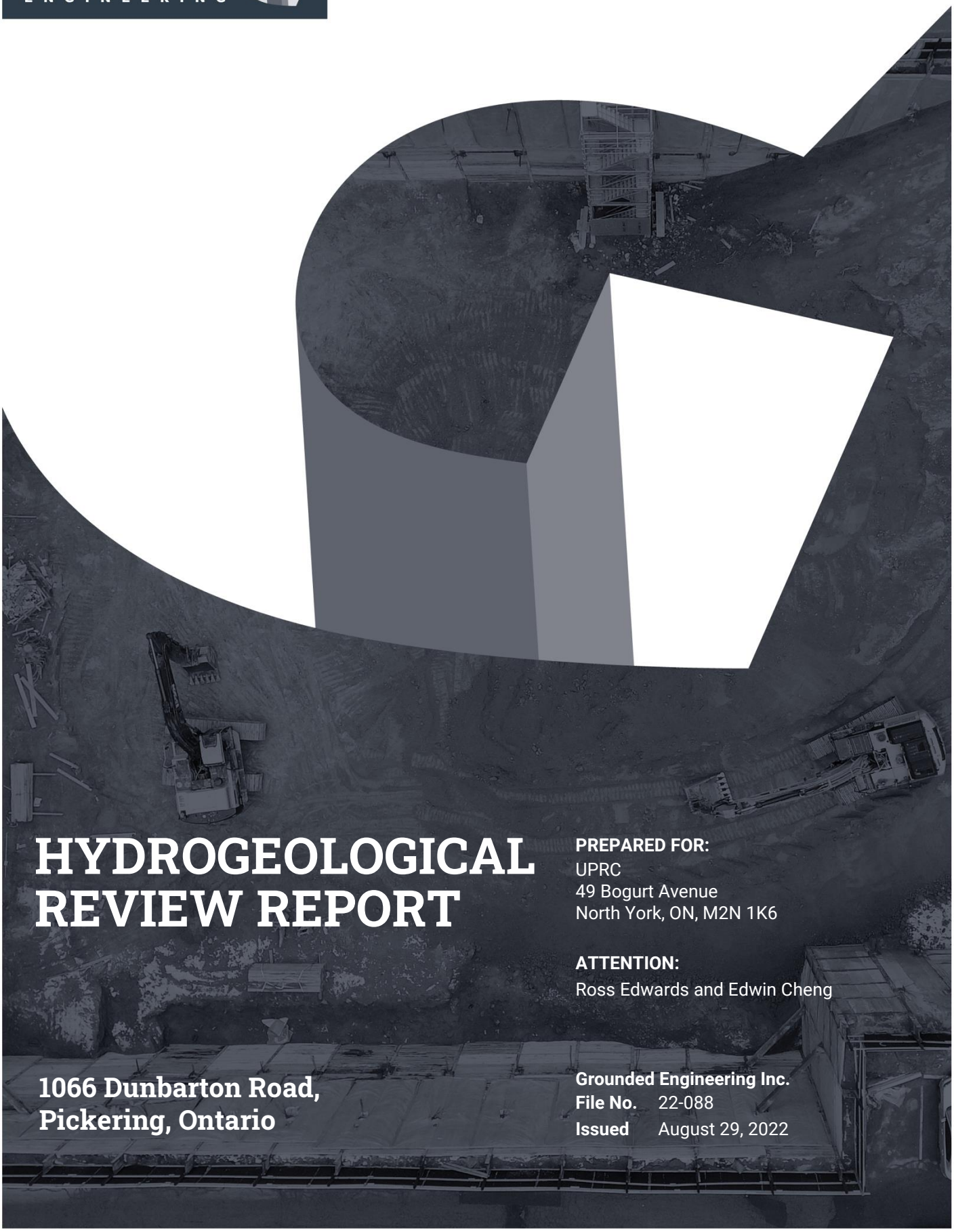
GROUNDED ENGINEERING



HYDROGEOLOGICAL REVIEW REPORT

PREPARED FOR:
UPRC
49 Bogurt Avenue
North York, ON, M2N 1K6

ATTENTION:
Ross Edwards and Edwin Cheng

1066 Dunbarton Road, Pickering, Ontario

Grounded Engineering Inc.
File No. 22-088
Issued August 29, 2022

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

Executive Summary

Grounded Engineering Inc. (Grounded) was retained by UPRC to conduct a Hydrogeological Review for the proposed redevelopment of 1066 Dunbarton Road in Pickering, Ontario (site). The conclusions of the investigation are summarized as follows:

Site Information

Existing Development

Site	Above Grade Levels	Below Grade Levels			
		Level #	Lowest Finished Floor		Approximate Base of Foundations (masl)
			Depth (m)	Elevation (masl)	
1066 Dunbarton Rd./ Preliminary	1	1	n/a	n/a	n/a

Proposed Development

Site	Above Grade Levels	Below Grade Levels			
		Level #	Lowest Finished Floor		Approximate Base of Foundations (masl)
1066 Dunbarton Rd. / Preliminary			Depth (m)	Elevation (masl)	
Townhouse 1	3	1	2.8	97.05	96.55
Townhouse 2	3	1	2.8	97.05	96.55
Townhouse 3	3	1	2.8	96.1	95.6
Townhouse 4	3	1	2.8	95.05	94.55
Townhouse 5	3	1	2.8	93.42	92.92

Site Conditions

Site Stratigraphy

Stratum/Formation	Aquifer or Aquitard	Depth Range (mbgs)	Elevation Range (masl)	Hydraulic Conductivity (m/s)	Method
Fill	Aquifer	0.2 - 0.8	100.0 – 97.9	1.0×10^{-5}	Literature
Silt and Sand	Aquifer	0.8 – 4.6	99.5 – 94.1	5.0×10^{-7}	Literature
Clayey Silt	Aquifer	4.6 – 8.2	95.7 – 90.5	7.21×10^{-9}	Slug Test

Groundwater Elevation

Design Groundwater Elevation (masl) (see Figure 4)	**98.7, 94.0, 95.8**

Groundwater Quality				
Sample ID	**Sample Date**	**Sample Expiry Date**	**Region of Durham Storm Sewer Limits**	**Region of Durham Sanitary Sewer Limits**
BH3	May 12, 2022	n/a	Exceeds	Meets

Groundwater Control

Stored Groundwater (pre-excavation/dewatering)						
Townhouse ID	**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**
1	317	206	200	200,000	100	100,000
2	317	206	200	200,000	100	100,000
3	317	-	-	-	-	-
4	317	-	-	-	-	-
5	317	276	200	200,000	100	100,000

Short Term (Construction) Steady State Groundwater Quantity – Safety Factor of 2.0 Used						
Townhouse ID	**Estimated Groundwater Seepage**		**Design Rainfall Event (25mm)**		**Estimated Total Daily Water Takings**	
	L/day	**L/min**	**L/day**	**L/min**	**L/day**	**L/min**
1	30,000	20.8	2,880	2.0	32,880	22.8
2	30,000	20.8	2,880	2.0	32,880	22.8
3	-	-	3,000	2.1	3,000	2.1
4	-	-	3,000	2.1	3,000	2.1
5	4,000	2.8	2,880	2.0	6,880	4.8

Long Term (Permanent) Steady State Groundwater Quantity – Safety Factor of 2.0 Used						
Townhouse ID	**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**
1	30,000	20.8	3,000	2.1	33,000	22.9
2	30,000	20.8	3,000	2.1	33,000	22.9
3	-	-	3,000	2.1	3,000	2.1
4	-	-	3,000	2.1	3,000	2.1
5	4,000	2.8	3,000	2.1	7,000	4.9

Land Stability		
	Short Term (Construction)	**Long Term (Permanent)**
Maximum Zone of Influence (m)	29	29
Maximum Potential Settlement (mm)	4	4

Regulatory Requirements	
Environmental Activity and Sector Registry (EASR) Posting	Not 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 Pickering / Durham Region	Required
Long Term Discharge Agreement City of Pickering / Durham Region	Required

TABLE OF CONTENTS

FIGURES

APPENDICES

1 Introduction

Drawings showing the proposed building in plan and profile are currently not available for review. Grounded must be retained to review the architectural drawings prior to construction to ensure that borehole coverage is adequate and that the boreholes are sufficient deep for the proposed development.

UPRC has retained Grounded Engineering Inc. ("Grounded") to provide hydrogeological engineering design advice for their proposed development at 1066 Dunbarton Road, in Pickering, Ontario.

Property Information	
Location of Site	1066 Dunbarton Road, Pickering, Ontario, L1V 1G8
Ownership of Site	UPRC
Site Dimensions (m)	Approximately 95 m (N/S) x 90 m (E/W)
Site Area (m^2)	Approximately 8,550 m^2

Existing Development	
Number of Building Structures	1
Number of Above Grade Levels	1
Number of Underground Levels	1
Sub-Grade Depth of Development (m)	Approximately 4.0
Sub-Grade Area (m^2)	Approximately 600
Land Use Classification	Commercial

Proposed Development	
Number of Building Structures	5 new building structures
Number of Above Grade Levels	3
Number of Underground Levels	1
Sub-Grade Depth of Development (m)	2.8 m (5 x partial 8m x12m basements only, remainder of building areas will be on-grade)
Sub-Grade Area (m^2)	96 m^2 per partial basement (x 5)
Land Use Classification	Residential

Qualified Person and Hydrogeological Review Information	
Qualified Person	Kyle Byckalo
Consulting Firm	Grounded Engineering Inc.
Date of Hydrogeological Review	August 29, 2022
Scope of Work	▪ Review of MECP Water Well Records for the area ▪ Review of geological information for the area ▪ Review of topographic information for the area ▪ Advancement of 3 boreholes to a maximum depth of 8 m, which were instrumented with 3 monitoring wells. ▪ Completion of slug tests in all available monitoring wells. ▪ Groundwater elevation monitoring for three (3) months on a bi-weekly basis ▪ Groundwater sampling and analysis to the Region of Durham ▪ Assessment of groundwater controls and potential impacts ▪ Report preparation in accordance with Ontario Water Resources Act, Ontario Regulation 387/04

General Hydrogeological Characterization	
Site Topography	The site has an approximate ground surface elevation of 99.5 masl.
Local Physiographic Features	The site is composed of silt and sand overlaying clayey silt deposits.
Regional Physiographic Features	The Iroquois plain on the north shore of Lake Ontario from Scarborough to Newcastle. A sand plain comprised of mosaic till plains and areas of silty lacustrine deposits. The two most important soils of the area are Darlington loam and Newcastle loam, the former developed on the upland areas of till and the latter on the lacustrine sediments in the lower lying areas. They are both good, well drained soils but in some areas can be poorly drained.
Watershed	The site is located within the Lake Ontario Waterfront. Watershed. Locally, groundwater is anticipated to flow south towards Lake Ontario.
Surface Drainage	Surface water is expected to flow towards municipal catch basins located on or adjacent to the site, via Dunbarton Road to the South.

2 Study Area Map

A map has been enclosed which shows the following information:

- All monitoring wells identified on site
- All monitoring wells identified off site within the study area
- All boreholes identified on site
- All buildings identified on site and within the study area
- The 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 are as follows:

Site Stratigraphy

Stratum/Formation	Aquifer or Aquitard	Depth Range (mbgs)	Elevation Range (masl)	Hydraulic Conductivity (m/s)	Method of Determination
Fill	Aquifer	0.2 - 0.8	100.0 – 97.9	1.0×10^{-5}	Literature
Silt and Sand	Aquifer	0.8 – 4.6	99.5 – 94.1	5.0×10^{-7}	Grain Size
Clayey Silt	Aquifer	4.6 – 8.2	95.7 – 90.5	7.21×10^{-9}	Slug Test

Surface Water

Surface Water Body	Distance from site (m)	Direction from site	Hydraulically Connected to Site (yes/no)
Lake Ontario	Approximately 550	South	no

4 Monitoring Well Information

Well ID	Well Diameter (mm)	Ground Surface (masl)	Top of Screen (masl)	Bottom of Screen (masl)	Screened Geological Unit
BH1	50	98.7	94.2	91.1	Clayey Silt
BH2	50	100.3	95.7	92.7	Clayey Silt

Well ID	Well Diameter (mm)	Ground Surface (masl)	Top of Screen (masl)	Bottom of Screen (masl)	Screened Geological Unit
BH3	50	99.2	94.6	91.6	Clayey Silt

5 Groundwater Elevations

Well ID	Groundwater Elevation (masl)			
	May 12th, 2022	May 26th, 2022	June 22nd, 2022	Maximum
BH1	93.1	93.9	94.0	**94.0**
BH2	98.7	98.7	98.6	**98.7**
BH3	93.8	95.5	95.8	**95.8**

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.

For preliminary design purposes, the design groundwater elevation for each of the proposed townhouse structures is provided in the table below.

Building Structure(s)	Design Groundwater Elevation (m)
Townhouses 1 and 2	**98.7**
Townhouses 3 and 4	**94.0**
Townhouse 5	**95.8**

6 Aquifer Testing

6.1 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)
BH2	95.7 – 92.7	Clayey Silt	7.21×10^{-9}
BH3	94.6 – 91.6	Clayey Silt	5.05×10^{-9}

6.2 Soil Grain Size Distribution

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

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

Sample ID	Soil Description	Applicable Analysis Methods	Hydraulic Conductivity (m/s)
BH1-SS3	Sandy Silt, clayey	Alyamani and Sen, Barr, Sauerbrei	4.8×10^{-7}
BH2-SS6	Clay with fines	Alyamani and Sen, Barr, Sauerbrei	1.4×10^{-9}
BH3-SS4	Clay with fines	Alyamani and Sen, Barr, Sauerbrei	1.3×10^{-9}
BH3-SS8	Clay with fines	Alyamani and Sen, Barr, Sauerbrei	1.0×10^{-9}

The results of the analyses are presented in Appendix D.

6.3 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}
Silt and Sand	10^{-5} to 10^{-9}
Clayey Silt	10^{-7} to 10^{-10}

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 BH3 on May 12th, 2022. The sample was analyzed for the following parameters:

- Durham Region Sanitary Sewers Discharge Criteria (55-2013)
- Durham Region Storm Sewers Discharge Criteria (55-2013)

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

- Total Suspended Solids (Limit 15 mg/L, Result 110 mg/L)

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

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

8 Proposed Construction Method

The proposed methodology to support open excavations at the site is currently undetermined. For the purposes of this report, equivalent well analyses were conducted employing conventional open cut excavation in order to determine a “worst-case scenario” with respect to dewatering volumes and groundwater seepage at the site.

For design purposes, the groundwater table is at about Elev. 98.7± masl for Townhouses 1 and 2 in the silt and sand deposits, at Elev. 94.0± masl for Townhouses 3 and 4 in the clayey silt deposit, and at Elev. 95.8± masl for Townhouse 5 also in the clayey silt deposit. These deposits have a relatively low permeability and will yield only minor seepage in the long term. The groundwater table is present in all of the native soil units.

The lowest (B1) FFE for all Townhouses 1 and 2 is at Elev. 97.05± m, Townhouse 3 is at Elev. 96.1± m, Townhouse 4 is at Elev. 95.05± m and Townhouse 5 is at Elev. 93.42± m. Therefore,

- Bulk excavations for basements will extend below the elevation of the design groundwater table(s) for Townhouses 1, 2, and 5.
- Foundation excavations will be made in relatively low-permeability soils below the design groundwater table.
- Bulk excavations for basements will remain above the design groundwater table(s) for Townhouses 3 and 4.
- Foundation excavations may extend below the design groundwater table, however they will be made in relatively low-permeability soils.

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

Stored water within the excavation will need to be considered prior to excavation/dewatering.

If it is proposed to discharge groundwater to the municipal sewers, 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.

9 Private Water Drainage System (PWDS)

If the proposed development consists of drained foundations, then a private water drainage system will be required for structures with basements constructed below the groundwater table. The total sub floor drain area is approximately 96 m^2 per basement based on an excavated area of 12 m x 8 m.

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

If the proposed basements are designed as watertight structures, then a private water drainage system will not be required. However, the structure must then be designed to resist hydrostatic pressure and uplift forces.

10 Groundwater Extraction and Discharge

Equivalent well analyses were conducted for both short-term and long-term dewatering scenarios. Equivalent well analyses for groundwater seepage indicates the short term (construction) and long term (permanent) dewatering requirements as provided below. The results are presented in Appendix G.

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

Please note that if excavation is exposed to the elements, 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 10,000 L.

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

- A Factor of Safety of 2.0 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^{-5}
Silt and Sand	5.0×10^{-7}
Clayey Silt	7.21×10^{-9}

Stored Groundwater (pre-excavation/dewatering)

Townhouse ID	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
1	317	206	200	200,000	100	100,000
2	317	206	200	200,000	100	100,000
3	317	-	-	-	-	-
4	317	-	-	-	-	-
5	317	317	276	200	200,000	100

Short Term (Construction) Steady State Groundwater Quantity – Safety Factor of 2.0 Used

Townhouse ID	Estimated Groundwater Seepage		Design Rainfall Event (25mm)		Estimated Total Daily Water Takings	
	L/day	L/min	L/day	L/min	L/day	L/min
1	30,000	20.8	2,880	2.0	32,880	22.8
2	30,000	20.8	2,880	2.0	32,880	22.8
3	-	-	3,000	2.1	3,000	2.1
4	-	-	3,000	2.1	3,000	2.1
5	4,000	2.8	2,880	2.0	6,880	4.8

Long Term (Permanent) Steady State Groundwater Quantity – Safety Factor of 2.0 Used						
Townhouse ID	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
1	30,000	20.8	3,000	2.1	33,000	22.9
2	30,000	20.8	3,000	2.1	33,000	22.9
3	-	-	3,000	2.1	3,000	2.1
4	-	-	3,000	2.1	3,000	2.1
5	4,000	2.8	3,000	2.1	7,000	4.9

Regulatory Requirements	
Environmental Activity and Sector Registry (EASR) Posting	Not 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 Pickering / Durham Region	Required
Long Term Discharge Agreement City of Pickering / Durham Region	Required

Please note:

- The native soils must be dewatered a minimum of 1.2 m below the footing elevation prior to foundation excavation to preserve the in-situ integrity of the native soils during construction dewatering activities.
- 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.
- The proposed pump schedule for long term permanent drainage has not been completed. As such the actual peak long term discharge rate is not available at the time writing of this report. The pump schedule must be specified by the mechanical consultant if necessary.
- Watertight basement structures (that do not include a private water drainage system) have not been considered as part of the proposed development at this time.
- 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 (ZOI)

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

The ZOI was calculated using the Sichardt equation below.

Equation:

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

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)	**Long Term (Permanent)**
Maximum Zone of Influence (m)	29	29

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)	4.6	4.6
Increase in Effective Stress (kPa)	45	45
Maximum Theoretical Settlement due to Dewatering (mm)	4	4
Public Realm Theoretical Settlement due to Dewatering (mm)	4	4

The theoretical maximum induced settlement occurs directly adjacent to the proposed excavation and decreases in a nonlinear fashion with distance away from the excavation.

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 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 Pickering. 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

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

As a result of dewatering and draining the soil, changes in groundwater level have the potential to cause settlement based on the change in the effective stresses within the ZOI.

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.

Both the temporary construction dewatering system and the permanent building drainage 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.

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

The authorized users of this report are UPRC and their design team, for whom this report has been prepared. Grounded Engineering Inc. maintains the copyright and ownership of this document. Reproduction of this report in any format or medium requires explicit prior authorization from Grounded Engineering Inc. The City of Pickering and/or Durham Region may also make use of and rely upon this report, subject to the limitations as stated.

Drawings showing the proposed building in plan and profile are currently not available for review. Grounded must be retained to review the architectural drawings prior to construction to ensure

that borehole coverage is adequate and that the boreholes are sufficient deep for the proposed development.

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,

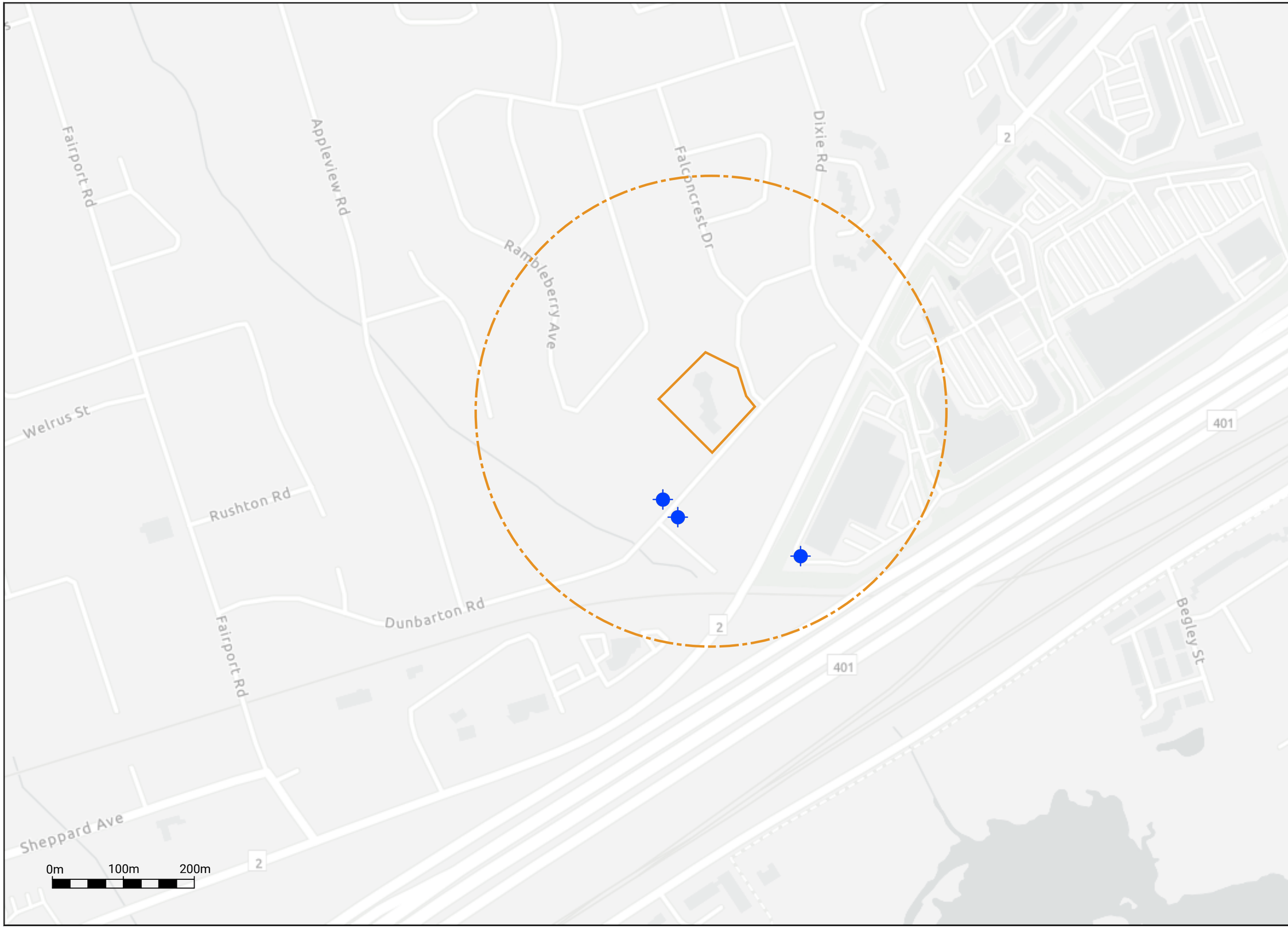
GROUNDED ENGINEERING

Sam Bastan, P. Eng.,
Project Engineer

Kyle Byckalo, P. Eng.,
Senior Project Engineer

Matt Bielaski, P.Eng., QP_RA-ESA
Principal

FIGURES



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

LEGEND

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

Note

Reference

ArcGIS MyMaps 2022.

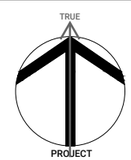
Project

1066 DUNBARTON ROAD, PICKERING, ONTARIO

Figure Title

SITE LOCATION PLAN

North



Date

AUGUST 2022

Scale

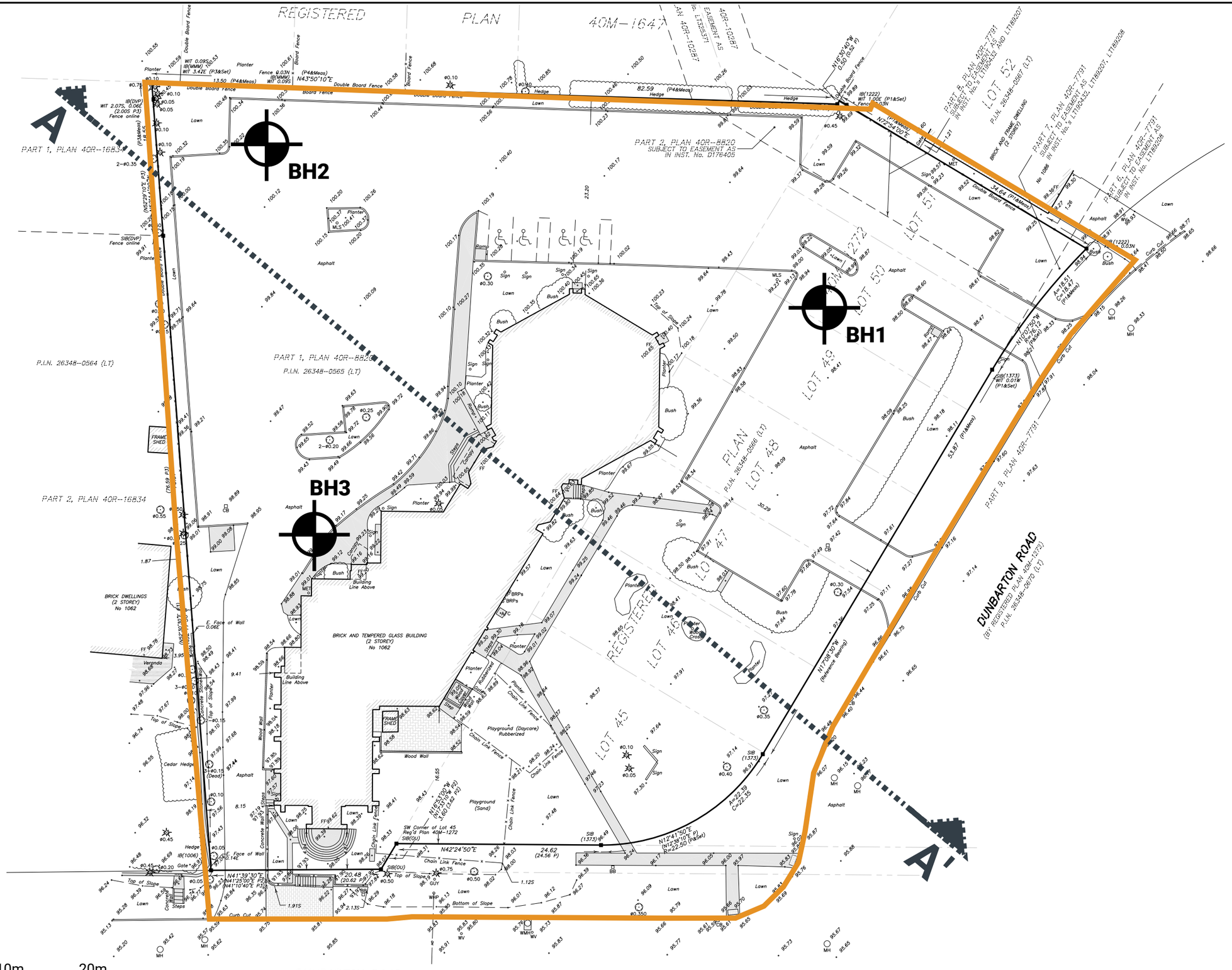
AS INDICATED

Job No

22-088

Figure No

FIGURE 1



GROUNDED ENGINEERING

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

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- BOREHOLE WITH MONITORING WELL
- SECTION LOCATION (A — A)

Note

Reference

Survey Drawing Job No.: 220-0021
Dated: Apr. 22, 2022
Prepared by: Speight, Van Nortrand & Gibson Limited.

Project

1066 DUNBARTON ROAD, PICKERING, ONTARIO

Figure Title

BOREHOLE LOCATION PLAN - EXISTING

North

TRUE
PROJECT

Date

AUGUST 2022

Scale

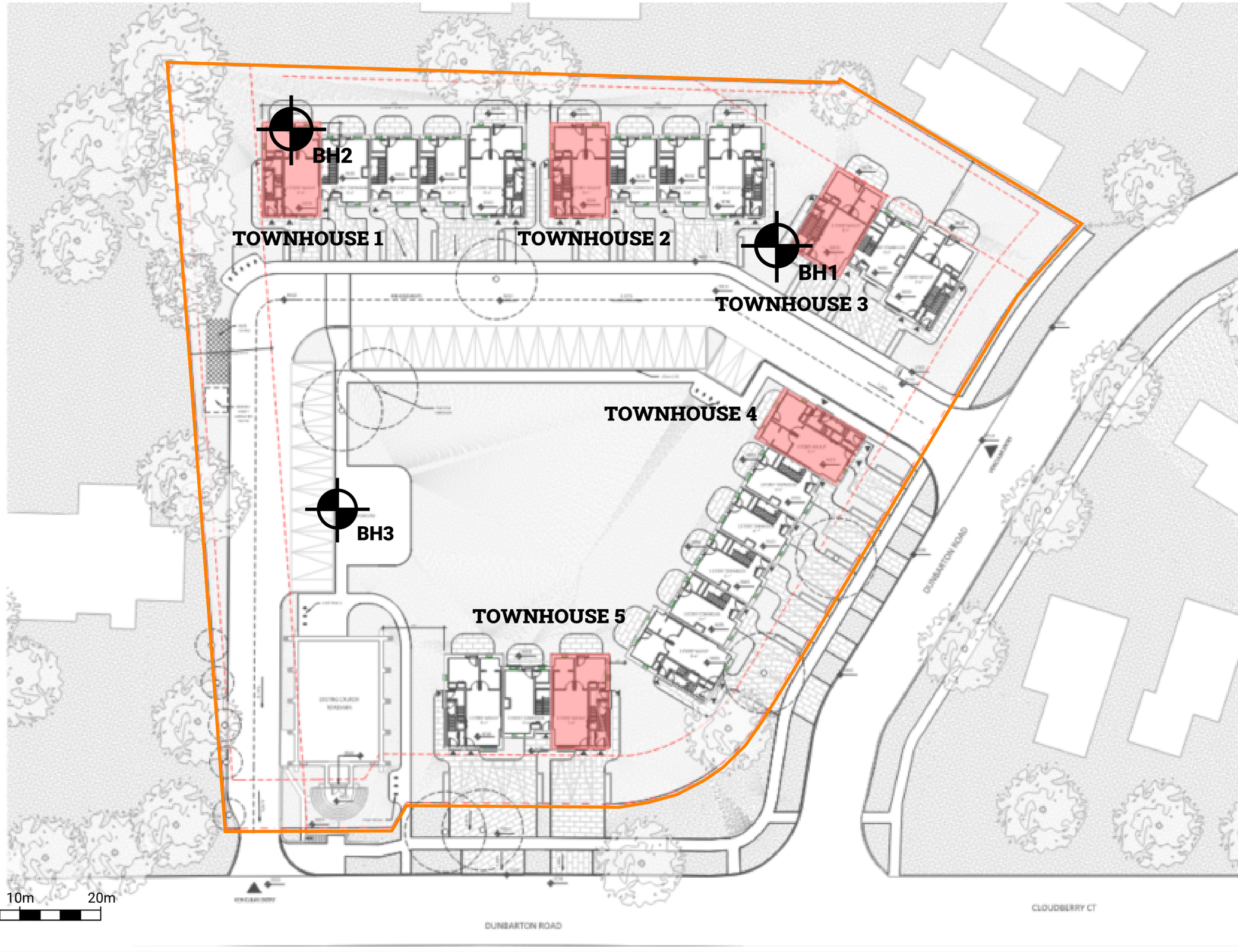
AS INDICATED

Job No

22-088

Figure No

FIGURE 2



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

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- MONITORING WELL LOCATION

Note

Reference

Conceptual Site Plan A1-03
Prepared by KBMB Architects
Dated 05/04/22
Received 06/30/22

Project

1066 DUNBARTON ROAD, PICKERING, ONTARIO

Figure Title

BOREHOLE LOCATION PLAN - PROPOSED

North

TRUE
PROJECT

Date

AUGUST 2022

Scale

AS INDICATED

Job No

22-088

Figure No

FIGURE 3

Townhouse 1 and 2

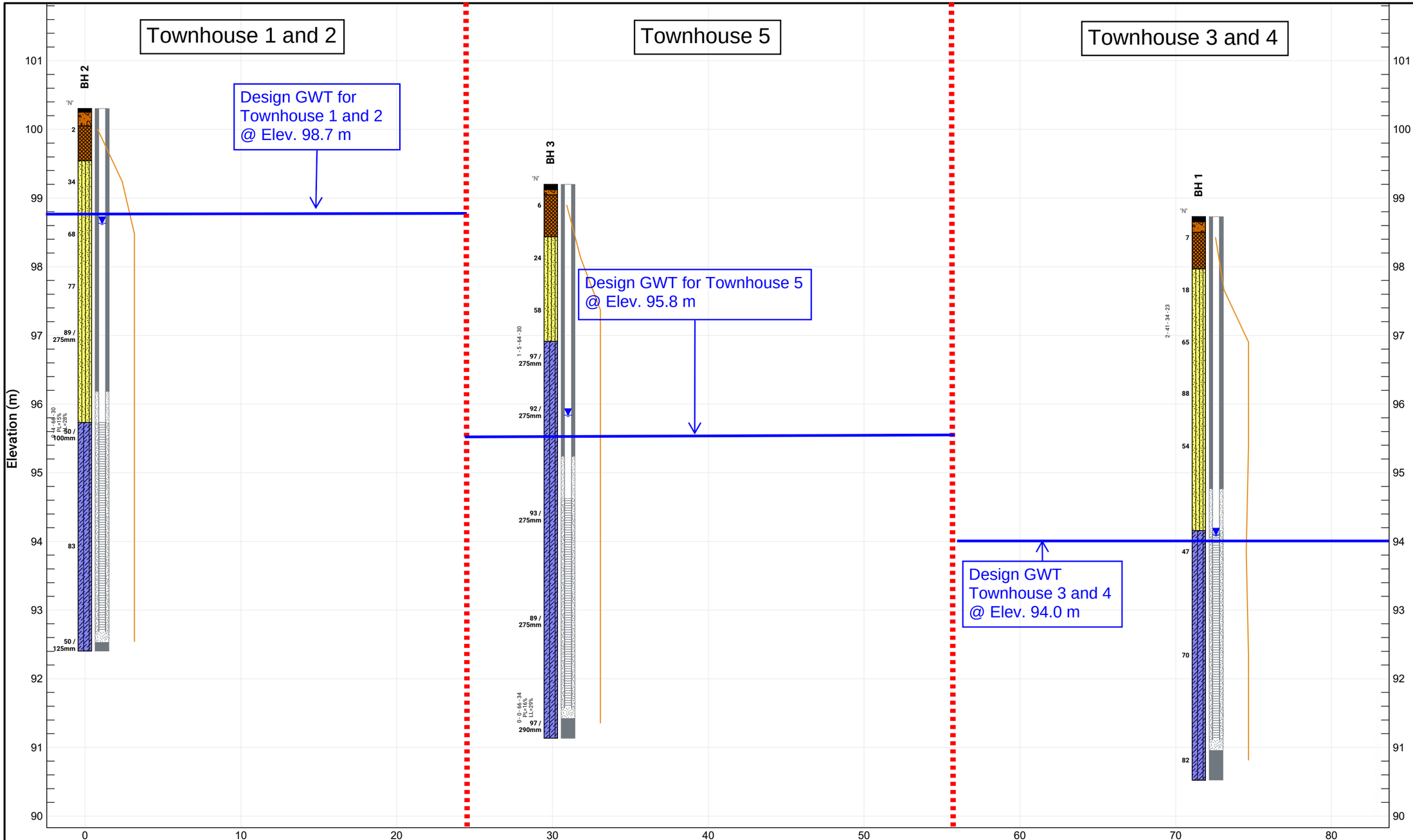
Townhouse 5

Townhouse 3 and 4

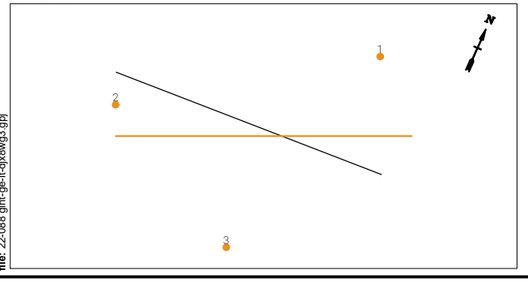
Design GWT for Townhouse 1 and 2 @ Elev. 98.7 m

Design GWT for Townhouse 5 @ Elev. 95.8 m

Design GWT Townhouse 3 and 4 @ Elev. 94.0 m



SITE MAP



file: 22-088 gint-ge-ll-djx8wg3.gpj

BOREHOLE STRATIGRAPHY LEGEND

- Asphalt
- Clayey Silt
- Aggregate
- Fill
- Silt and Sand

GROUNDED ENGINEERING

1 Banigan Drive, Toronto, Ont., M4H 1G3
www.groundedeng.ca

LEGEND

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

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

Project

1066 DUNBARTON RD. PICKERING, ON

Figure Title

SUBSURFACE PROFILE

Date

AUGUST 2022

Scale

AS INDICATED

Job No

22-088

Figure No

FIGURE 4

APPENDIX A

Preliminary

2022-08-05 2:01:17 PM

LEGEND

	SITE BOUNDARY
	SWALE
+ 170.72	PROPOSED ELEVATION
HP	HIGH POINT
LP	LOW POINT
+EX.167.16	EXISTING ELEVATION
+SW.167.16	SWALE ELEVATION
→	DIRECTION OF OVERLAND FLOW
□	STORMWATER CATCHBASIN

CLIENT

UNITED PROPERTY RESOURCE CORPORATION

TITLE

1066 DUNBARTON ROAD

PRELIMINARY SITE GRADING PLAN

100 Scotia Court
Whitby, ON L1N 8Y6
t. 905.668.3022
f. 905.668.9443
www.wsp.com

Checked	M.I.	Drawn	N.M.M
Date	AUGUST 2022	Proj. No.	221-05497
Scale	1:500	Figure No.	4

Aug 05, 2022 - 2:00pm, CANM076822
C:\Users\CANM076822\ACCDocs\WSP Canada projects (AMER)\100\Files\221-05497 - Dunbarton\PSR\Fig 4 - PRESR.dwg - tabs:Fig 4 - PRE GR

APPENDIX B

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

PI: plasticity index

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.

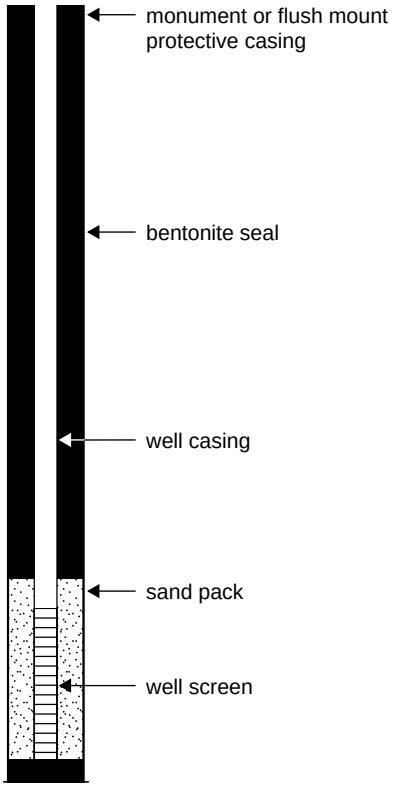
ASTM D3441 Cone Penetration Test (CPT)
Pushing an internal still rod with a outer hollow rod ("sleeve") tipped with a cone with an apex angle of 60° and a cross-sectional area of 1000 mm^2 into soil. The resistance is measured in the sleeve and at the tip to determine the skin friction and the tip resistance.

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



ROCK CORE TERMINOLOGY (MTO SHALE)

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

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

LOGGING DISCONTINUITIES

Discontinuity Type

BP bedding parting
CL cleavage
CS crushed seam
FZ fracture zone
MB mechanical break
IS infilled seam
JT Joint
SS shear surface
SZ shear zone
VN vein
VO void

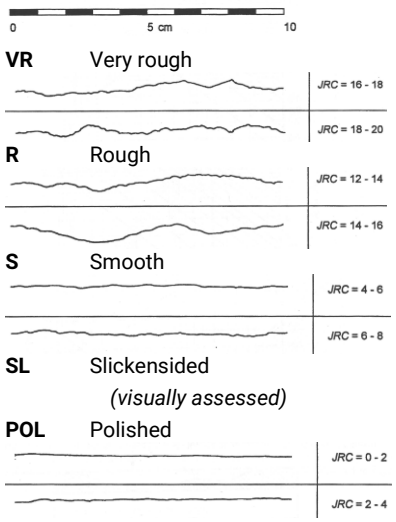
Coating

CN Clean
SN Stained
OX Oxidized
VN Veneer
CT Coating (>1 mm)

Dip Inclination

H	horizontal/flat	0 - 20°
D	dipping	20 - 50°
SV	sub-vertical	50 - 90°
V	vertical	90±°

Roughness (Barton et al.)



Spacing in Discontinuity Sets (*ISRM 1981*)

VC	very close	< 60 mm
C	close	60 – 200 mm
M	mod. close	0.2 to 0.6 m
W	wide	0.6 to 2 m
VW	very wide	> 2 m

Aperture Size

T	closed / tight	< 0.5 mm
GA	gapped	0.5 to 10 mm
OP	open	> 10 mm

Planarity

PR	Planar
UN	Undulating
ST	Stepped
IR	Irregular
DIS	Discontinuous
CU	Curved

GENERAL

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

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

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

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

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

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

BOREHOLE LOG 1

Date Started : May 2, 2022
Position : E: 652696, N: 4854591 (UTM 17T)
Elev. Datum : Geodetic

File No. : 22-088 **Project** : 1066 Dunbarton Rd., Pickering, ON **Client** : UPRC c/o Turner & Townsend

drill method : CME 75

hollow stem augers OD=215 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
98.7	**GROUND SURFACE**				
98.5 / 0.2	75mm **ASPHALT** 125mm **AGGREGATE**		1	SS	7
97.9 / 0.8	**FILL**, clayey silt, some sand, trace gravel, firm, brown, moist				
	SILT AND SAND, clayey, trace gravel, orange staining, very stiff to hard, greyish brown, moist		2	SS	18
	...at 1.5 m, silty sand, very dense		3	SS	65
	...at 2.3 m, sandy silt some clay		4	SS	88
			5	SS	54
94.1 / 4.6	**CLAYEY SILT**, some sand, hard, grey, moist		6	SS	47
			7	SS	70
			8	SS	82
90.5 / 8.2	**END OF BOREHOLE**				

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

elevation (m): 98, 97, 96, 95, 94, 93, 92, 91

well details

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

SS2: BTEX, Metals, PAHs, PCBs, PHCs, VOCs

2 41 34 23

SS8: BTEX, Metals, PAHs, PCBs, PHCs, VOCs, DUP

Dry and open upon completion of drilling.

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

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
May 12, 2022	5.6	93.1
May 26, 2022	4.8	93.9
Jun 22, 2022	4.7	94.0

file: 22-088 gint.gpj

Tech : LJ | **PM** : SB | **Rev** : NN

GROUNDED ENGINEERING

Date Started : May 2, 2022
Position : E: 652636, N: 4854550 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 2

File No. : 22-088 **Project** : 1066 Dunbarton Rd., Pickering, ON **Client** : UPRC c/o Turner & Townsend

drill method : CME 75

hollow stem augers OD=215 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
100.3	**GROUND SURFACE**				
100.0	75mm **ASPHALT**				
0.3	150mm **AGGREGATE**		1	SS	2
99.5	**FILL**, clayey silt, some sand, trace gravel, trace organics, black staining, soft, dark brown, moist				
0.8	**SILT AND SAND**, trace to some clay, dense, brown, moist		2	SS	34
	...at 1.5 m, very dense		3	SS	68
			4	SS	77
	...at 3.0 m, sandy silt, some clay		5	SS	89 / 275mm
95.7					
4.6	**CLAYEY SILT**, trace sand, hard, brown, moist		6	SS	50 / 100mm
			7	SS	83
			8	SS	50 / 125mm
92.4					
7.9	**END OF BOREHOLE**				

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

well details

elevation (m): 100 99 98 97 96 95 94 93

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

SS1: BTEX, Metals, PAHs, PCBs, PHCs, VOCs

0 4 66 30

SS7: Metals

SS8: BTEX, PAHs, PCBs, PHCs, VOCs

Dry and open upon completion of drilling.

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

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
May 12, 2022	1.6	98.7
May 27, 2022	1.6	98.7
Jun 22, 2022	1.7	98.6

file: 22-088 gint.gpj

Tech : LJ | **PM** : SB | **Rev** : NN

GROUNDED ENGINEERING

Date Started : May 2, 2022
Position : E: 652679, N: 4854527 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 3

File No. : 22-088 **Project** : 1066 Dunbarton Rd., Pickering, ON **Client** : UPRC c/o Turner & Townsend

drill method : CME 75

hollow stem augers OD=215 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
99.2	**GROUND SURFACE**				
99.0 / 0.2	75mm **ASPHALT** / 75mm **AGGREGATE**		1	SS	6
98.4 / 0.8	**FILL**, clayey silt, some sand, trace gravel, firm, brown, moist				
	SILT AND SAND, trace clay, compact, brown, moist		2	SS	24
	...at 1.5 m, very dense		3	SS	58
96.9 / 2.3	**CLAYEY SILT**, trace sand, trace gravel, hard, brown, moist		4	SS	97 / 275mm
	...at 3.0 m, sandy silt, some clay, some sand, grey, moist, hard		5	SS	92 / 275mm
	...at 4.6 m, clayey silt		6	SS	93 / 275mm
			7	SS	89 / 275mm
			8	SS	97 / 290mm
91.1 / 8.1	**END OF BOREHOLE**				

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

well details

elevation (m) 99 98 97 96 95 94 93 92

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

SS1: BTEX, Metals, PAHs, PCBs, PHCs, VOCs

1 5 64 30

0 0 66 34

SS8: BTEX, Metals, PAHs, PCBs, PHCs, VOCs

Dry and open upon completion of drilling.

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

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
May 12, 2022	5.4	93.8
May 26, 2022	3.7	95.5
Jun 22, 2022	3.4	95.8

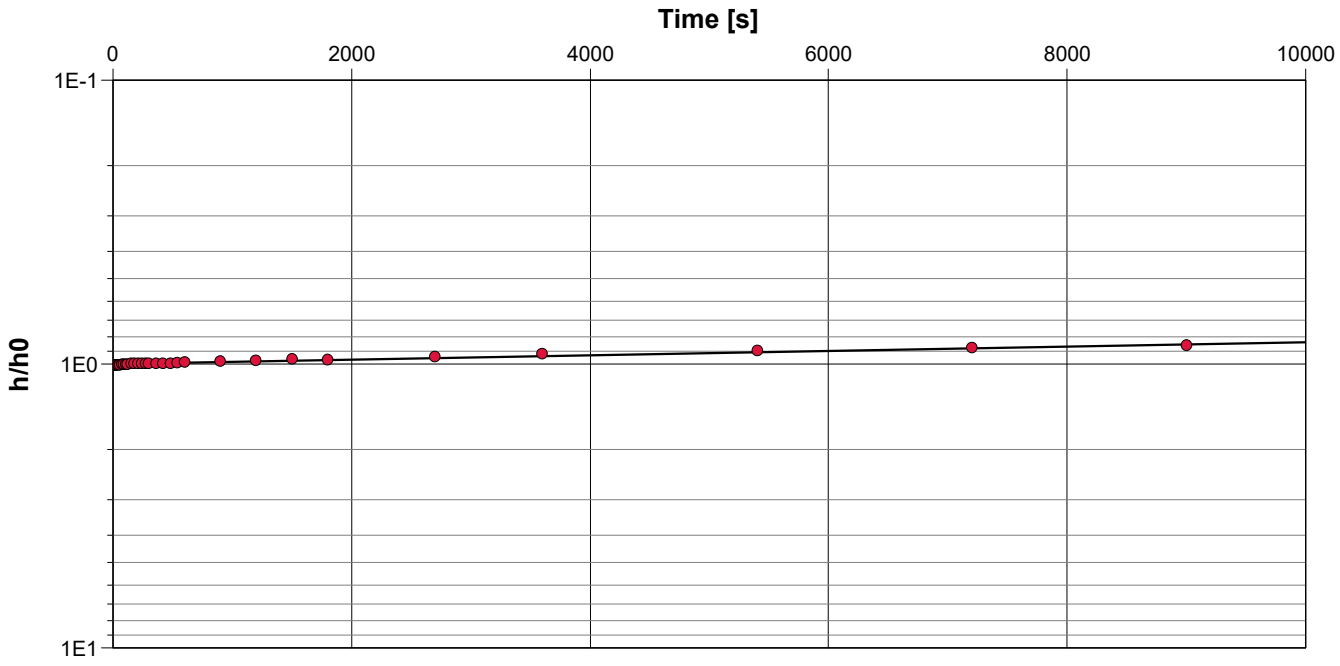
file: 22-088 gint.gpj

Tech : LJ | **PM** : SB | **Rev** : NN

APPENDIX C

GROUNDED ENGINEERING	**Slug Test Analysis Report**
	Project: 1066 Dunbarton Rd., Pickering
	Number: 22-088
	Client: Turner & Townsend

Location: 1066 Dunbarton Rd., Pickering	Slug Test: BH2	Test Well: BH2
Test Conducted by: LB		Test Date: 2022-05-31
Analysis Performed by: SB	Bouwer & Rice	Analysis Date: 2022-05-31
Aquifer Thickness: 7.92 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH2	7.21×10^{-9}	

GROUNDED ENGINEERING

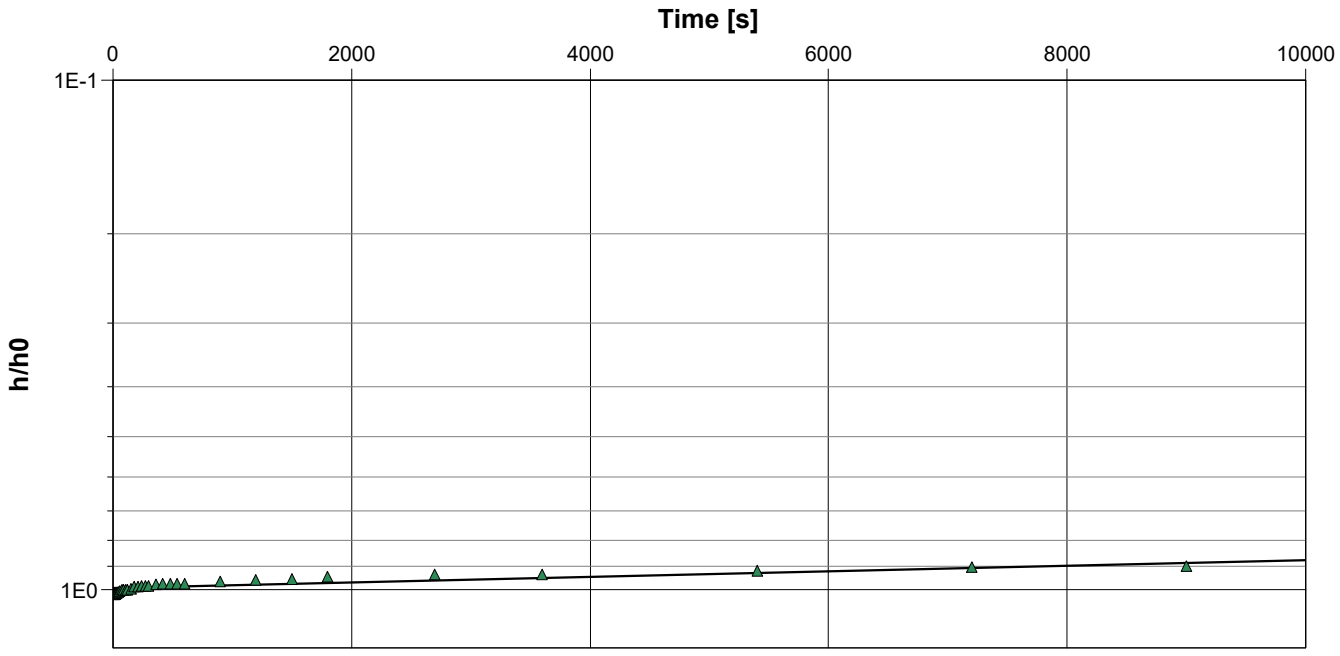
Slug Test Analysis Report

Project: 1066 Dunbarton Rd., Pickering

Number: 22-088

Client: Turner & Townsend

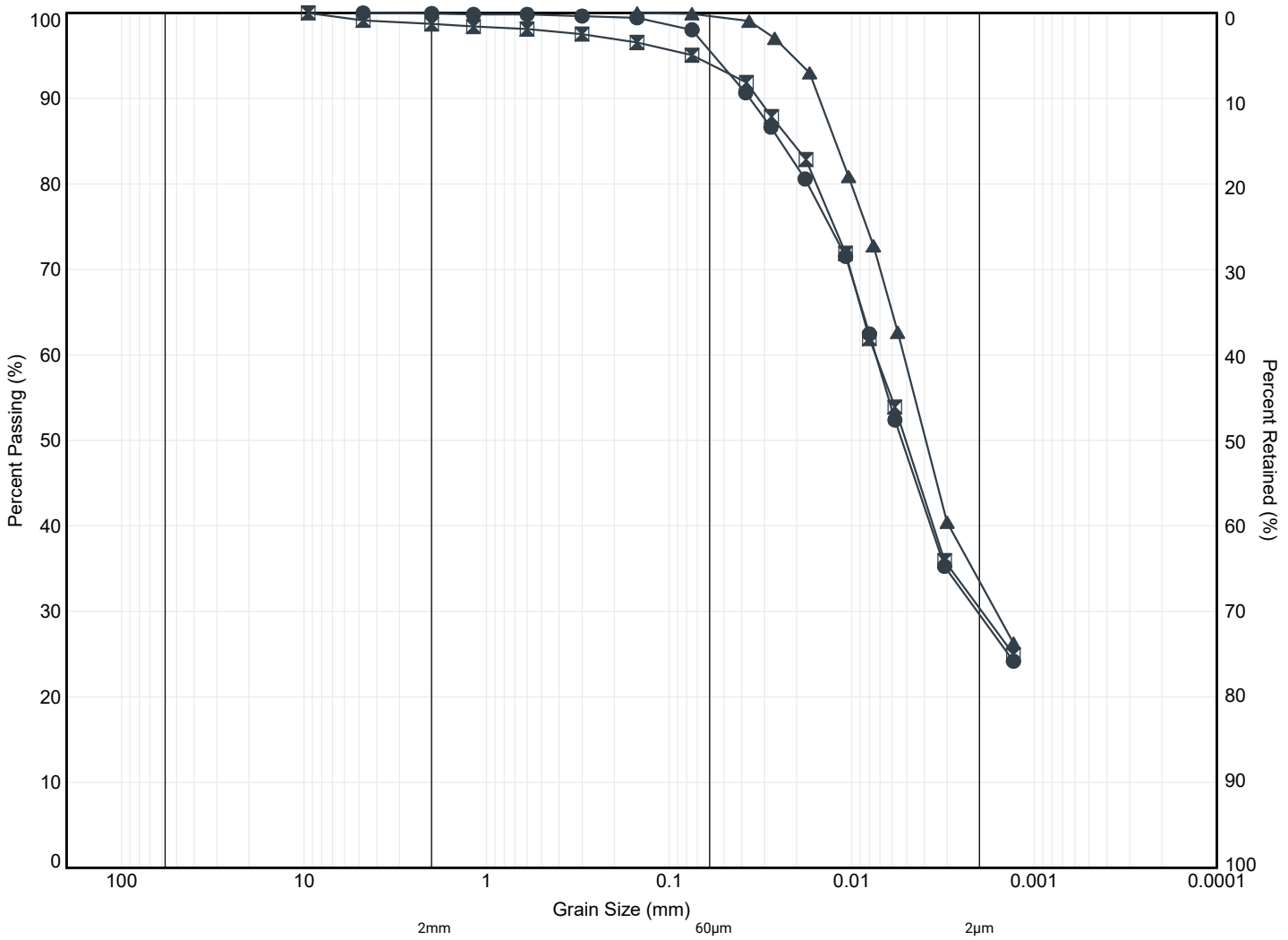
Location: 1066 Dunbarton Rd., Pickering	Slug Test: BH3	Test Well: BH3
Test Conducted by: LB		Test Date: 2022-05-12
Analysis Performed by: SB	Bouwer & Rice	Analysis Date: 2022-05-31
Aquifer Thickness: 7.92 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH3	5.10×10^{-9}	

APPENDIX D



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

MIT SYSTEM

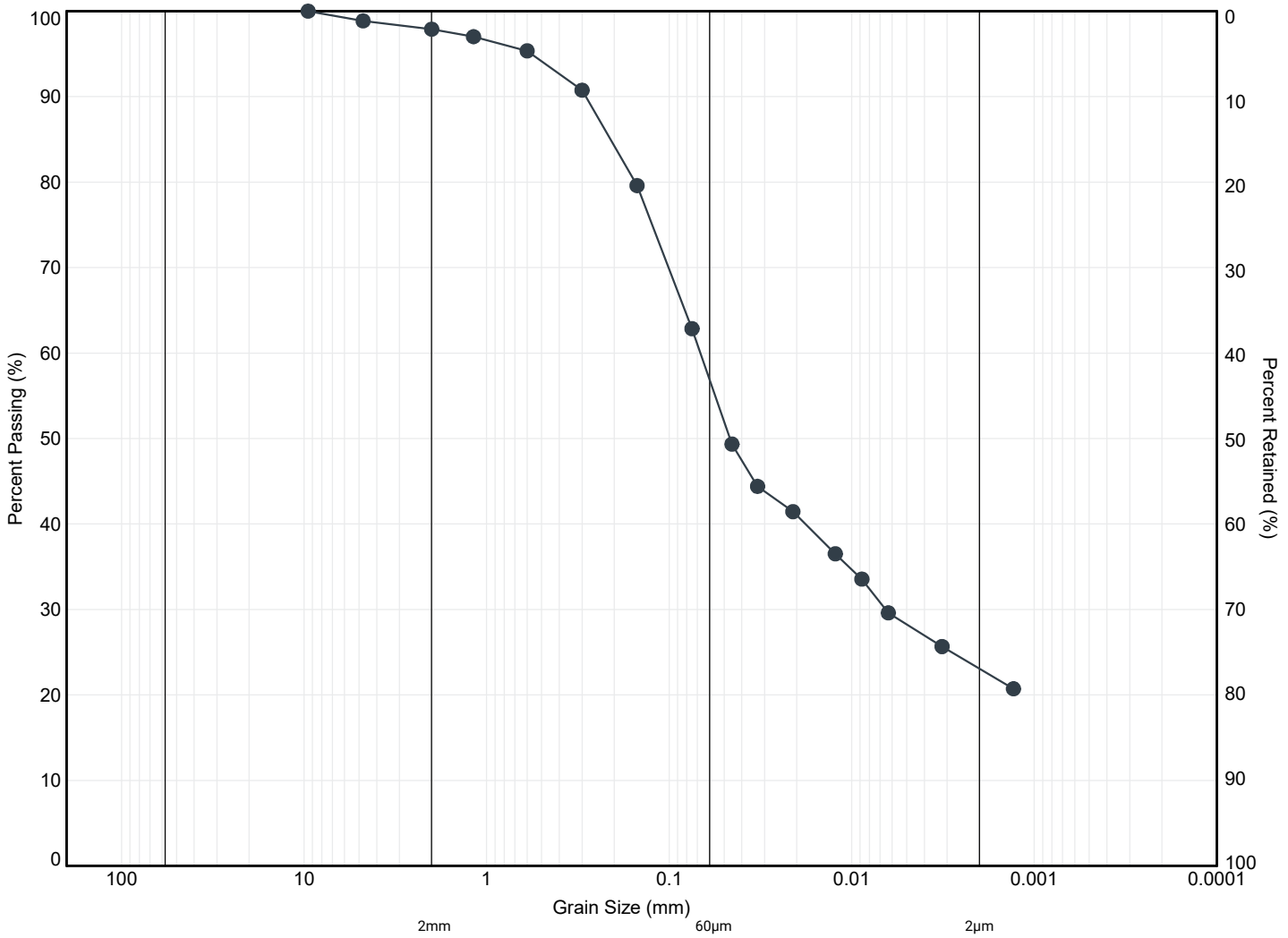
	Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
●	**2**	SS6	4.7	95.6	0	4	66	30
⊠	**3**	SS4	2.5	96.7	1	5	64	30
▲	**3**	SS8	7.8	91.4	0	0	66	34

GROUNDED ENGINEERING

Title: **GRAIN SIZE DISTRIBUTION**

File No.: **22-088**

file: 22-088.gint.gpj



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

MIT SYSTEM

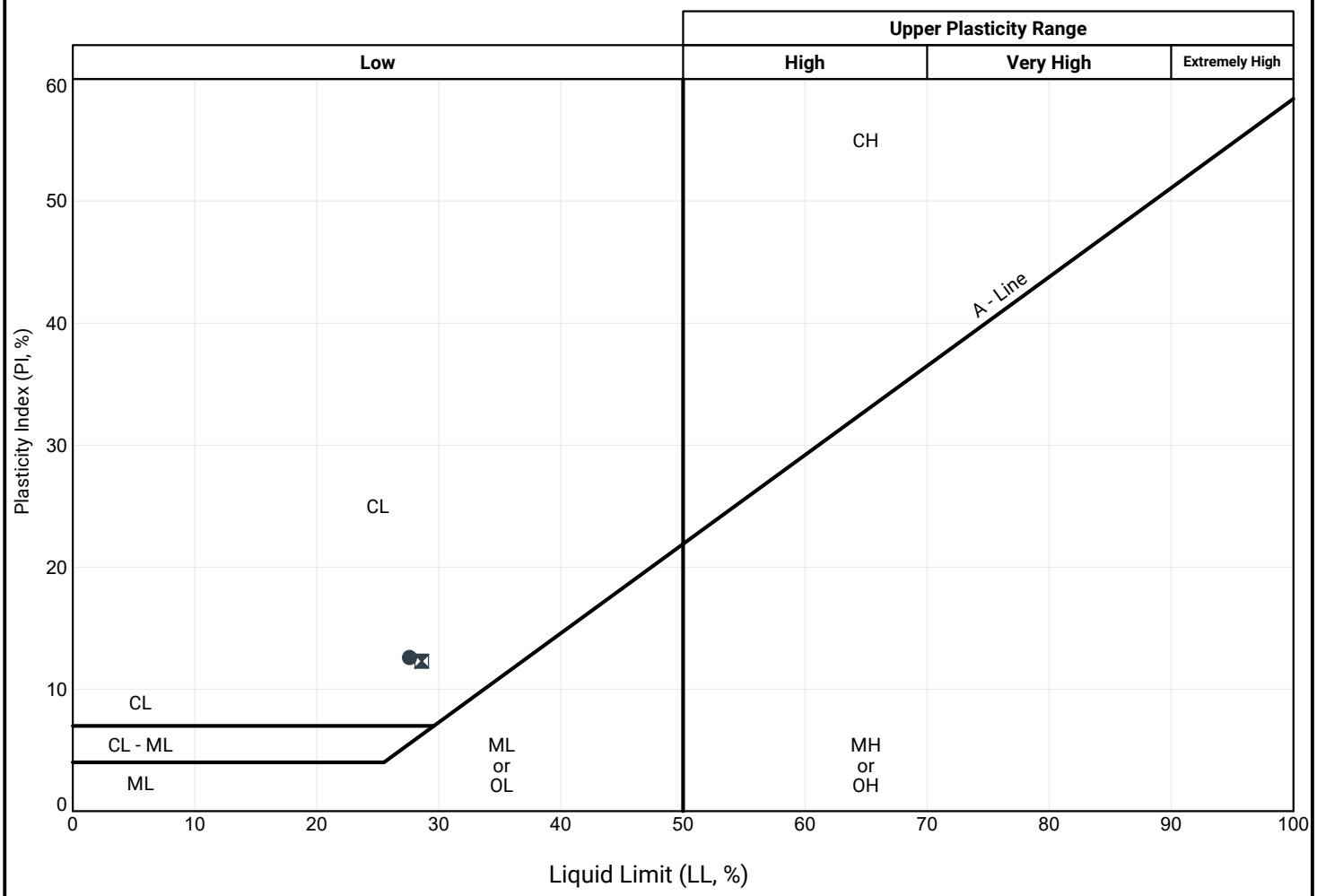
	Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
●	**1**	SS3	1.8	96.9	2	41	34	23

GROUNDED ENGINEERING

Title: **GRAIN SIZE DISTRIBUTION**

File No.: **22-088**

file: 22-088.gint.gpj



	Borehole	Sample	Depth (m)	Elev. (m)	LL (%)	PL (%)	PI (%)
●	**2**	SS6	4.7	95.6	28	15	13
⊠	**3**	SS8	7.8	91.4	29	16	13

GROUNDED ENGINEERING

Title: **ATTERBERG LIMITS CHART**

File No.: **22-088**

file: 22-088 gint.gpj

APPENDIX E

K from Grain Size Analysis Report

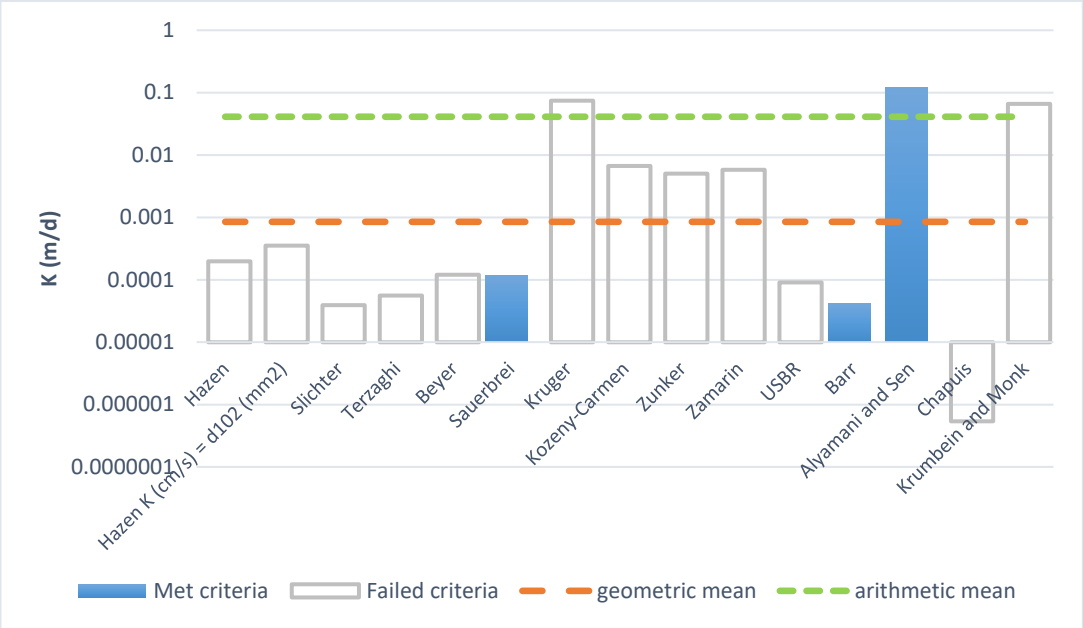
Date: 10-Jun-22

Sample Name: BH1 SS3

Mass Sample (g): 152.8

T (oC) 20

Poorly sorted sandy silt with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	2.3E-07	2.3E-09	0.00	
Hazen K (cm/s) = d_{10} (mm)	4.1E-07	4.1E-09	0.00	
Slichter	4.5E-08	4.5E-10	0.00	
Terzaghi	6.4E-08	6.4E-10	0.00	
Beyer	1.4E-07	1.4E-09	0.00	
Sauerbrei	1.4E-07	1.4E-09	0.00	
Kruger	8.6E-05	8.6E-07	0.07	
Kozeny-Carmen	7.7E-06	7.7E-08	0.01	
Zunker	5.8E-06	5.8E-08	0.01	
Zamarin	6.7E-06	6.7E-08	0.01	
USBR	1.0E-07	1.0E-09	0.00	
Barr	4.8E-08	4.8E-10	0.00	
Alyamani and Sen	1.4E-04	1.4E-06	0.12	
Chapuis	6.2E-10	6.2E-12	0.00	
Krumbein and Monk	7.7E-05	7.7E-07	0.07	
geometric mean	9.8E-07	9.8E-09	0.00	
arithmetic mean	4.8E-05	4.8E-07	0.04	

K from Grain Size Analysis Report

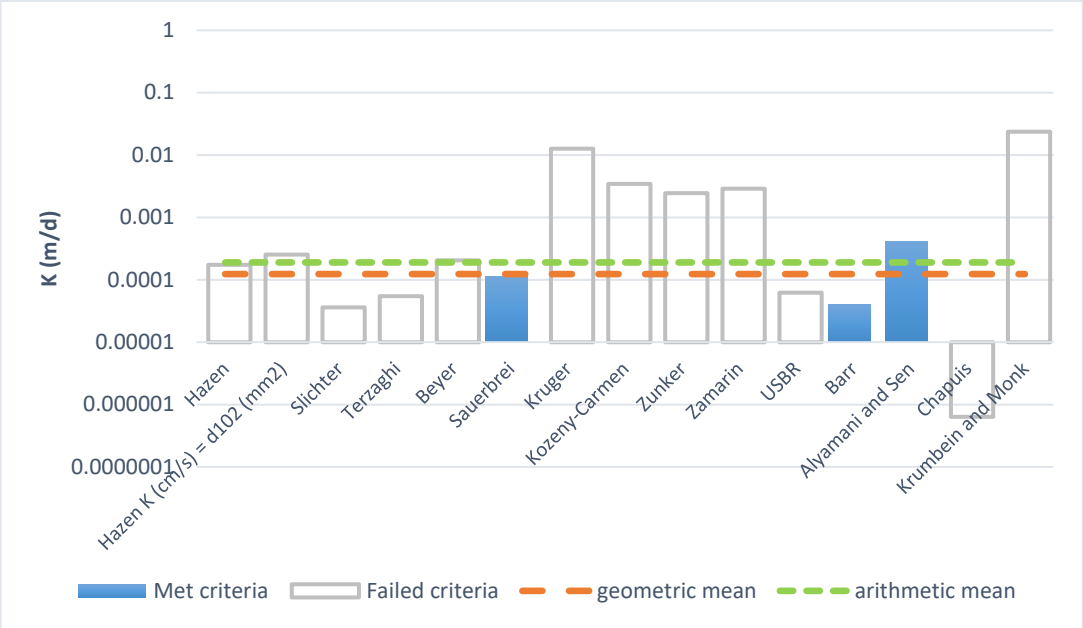
Date: 13-May-22

Sample Name: BH2 SS6

Mass Sample (g): 198.47

T (oC) 20

Poorly sorted clay with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	2.0E-07	2.0E-09	0.00	
Hazen K (cm/s) = d_{10} (mm)	2.9E-07	2.9E-09	0.00	
Slichter	4.2E-08	4.2E-10	0.00	
Terzaghi	6.3E-08	6.3E-10	0.00	
Beyer	2.4E-07	2.4E-09	0.00	
Sauerbrei	1.3E-07	1.3E-09	0.00	
Kruger	1.5E-05	1.5E-07	0.01	
Kozeny-Carmen	4.0E-06	4.0E-08	0.00	
Zunker	2.8E-06	2.8E-08	0.00	
Zamarin	3.4E-06	3.4E-08	0.00	
USBR	7.2E-08	7.2E-10	0.00	
Barr	4.6E-08	4.6E-10	0.00	
Alyamani and Sen	4.8E-07	4.8E-09	0.00	
Chapuis	7.4E-10	7.4E-12	0.00	
Krumbein and Monk	2.7E-05	2.7E-07	0.02	
geometric mean	1.4E-07	1.4E-09	0.00	
arithmetic mean	2.2E-07	2.2E-09	0.00	

K from Grain Size Analysis Report

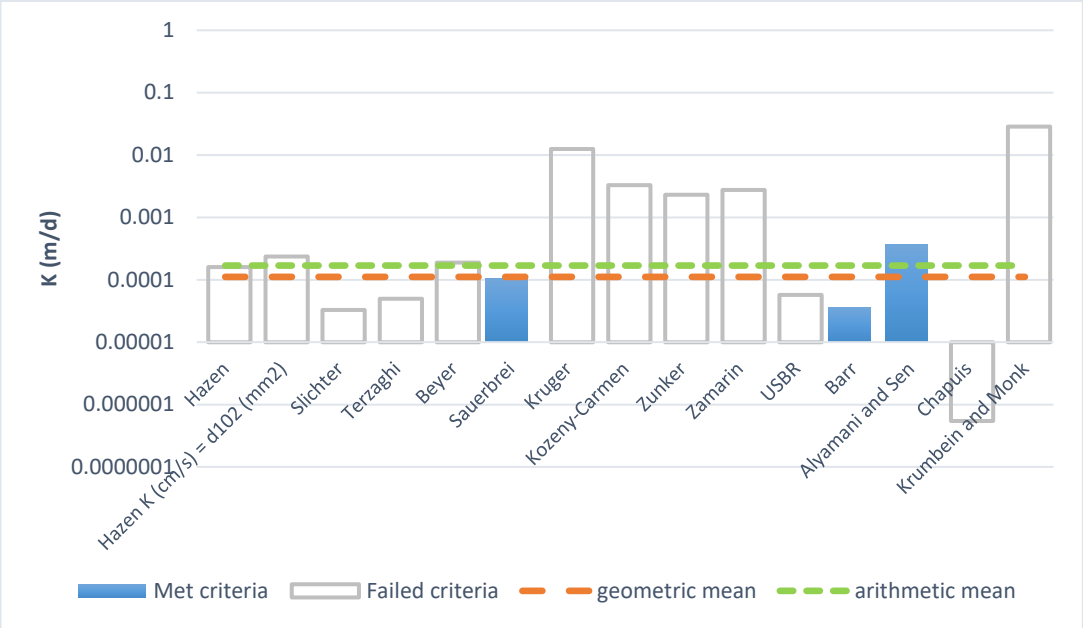
Date: 13-May-22

Sample Name: BH3 SS4

Mass Sample (g): 167.5

T (oC) 20

Poorly sorted clay with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	1.8E-07	1.8E-09	0.00	
Hazen K (cm/s) = d_{10} (mm)	2.7E-07	2.7E-09	0.00	
Slichter	3.8E-08	3.8E-10	0.00	
Terzaghi	5.8E-08	5.8E-10	0.00	
Beyer	2.2E-07	2.2E-09	0.00	
Sauerbrei	1.2E-07	1.2E-09	0.00	
Kruger	1.4E-05	1.4E-07	0.01	
Kozeny-Carmen	3.8E-06	3.8E-08	0.00	
Zunker	2.7E-06	2.7E-08	0.00	
Zamarin	3.2E-06	3.2E-08	0.00	
USBR	6.7E-08	6.7E-10	0.00	
Barr	4.2E-08	4.2E-10	0.00	
Alyamani and Sen	4.3E-07	4.3E-09	0.00	
Chapuis	6.3E-10	6.3E-12	0.00	
Krumbein and Monk	3.3E-05	3.3E-07	0.03	
geometric mean	1.3E-07	1.3E-09	0.00	
arithmetic mean	2.0E-07	2.0E-09	0.00	

K from Grain Size Analysis Report

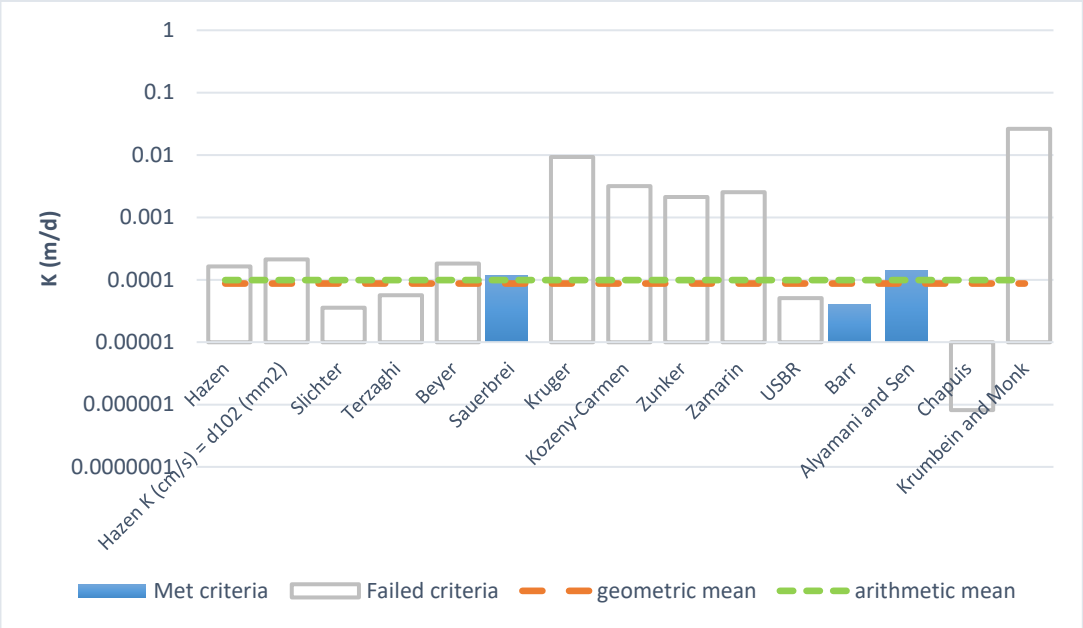
Date: 13-May-22

Sample Name: BH3 SS8

Mass Sample (g): 213.32

T (oC) 20

Poorly sorted clay with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	1.9E-07	1.9E-09	0.00	
Hazen K (cm/s) = d_{10} (mm)	2.5E-07	2.5E-09	0.00	
Slichter	4.1E-08	4.1E-10	0.00	
Terzaghi	6.5E-08	6.5E-10	0.00	
Beyer	2.1E-07	2.1E-09	0.00	
Sauerbrei	1.3E-07	1.3E-09	0.00	
Kruger	1.1E-05	1.1E-07	0.01	
Kozeny-Carmen	3.7E-06	3.7E-08	0.00	
Zunker	2.5E-06	2.5E-08	0.00	
Zamarin	2.9E-06	2.9E-08	0.00	
USBR	5.9E-08	5.9E-10	0.00	
Barr	4.7E-08	4.7E-10	0.00	
Alyamani and Sen	1.6E-07	1.6E-09	0.00	
Chapuis	9.4E-10	9.4E-12	0.00	
Krumbein and Monk	3.0E-05	3.0E-07	0.03	
geometric mean	1.0E-07	1.0E-09	0.00	
arithmetic mean	1.1E-07	1.1E-09	0.00	

APPENDIX F

Grounded Engineering Inc
ATTN: Sam Baston
1 Banigan Drive
TORONTO ON M4H 1G3

Date Received: 12-MAY-22
Report Date: 25-MAY-22 08:58 (MT)
Version: FINAL

Client Phone: 647-361-5136

Certificate of Analysis

Lab Work Order #: L2706126

Project P.O. #: NOT SUBMITTED
Job Reference: 22-088
C of C Numbers: 20-951299
Legal Site Desc:

Amanda Overholster
Account Manager

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Sewer Use Bylaws - Durham Sanitary Sewer (55-2013)						
(No parameter exceedances)						
Ontario Sewer Use Bylaws - Durham Storm Sewer - (55-2013)						
L2706126-1	BH3	Physical Tests	Total Suspended Solids	110	15	mg/L

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

ANALYTICAL REPORT

Physical Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2706126-1 Sample Date: 12-MAY-22 Sample ID: BH3
pH	pH units	6.00-10.5	6.0-9.0	8.37 PEHT
Total Suspended Solids	mg/L	350	15	110

Guide Limit #1: Durham Sanitary Sewer (55-2013)
Guide Limit #2: Durham Storm Sewer - (55-2013)

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

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

ANALYTICAL REPORT

Anions and Nutrients - WATER

			Lab ID	L2706126-1
			Sample Date	12-MAY-22
			Sample ID	BH3
Analyte	**Unit**	**Guide Limits #1**	**#2**	
Fluoride (F)	mg/L	10	-	0.479
Total Kjeldahl Nitrogen	mg/L	100	1	0.414
Phosphorus, Total	mg/L	10	0.4	0.0349
Sulfate (SO4)	mg/L	1500	-	39.7

Guide Limit #1: Durham Sanitary Sewer (55-2013)
Guide Limit #2: Durham Storm Sewer - (55-2013)

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

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

ANALYTICAL REPORT

Cyanides - WATER

			Lab ID	L2706126-1
			Sample Date	12-MAY-22
			Sample ID	BH3
		Guide Limits		
Analyte	Unit	#1	#2	
Cyanide, Total	mg/L	2	0.02	<0.0020

Guide Limit #1: Durham Sanitary Sewer (55-2013)
Guide Limit #2: Durham Storm Sewer - (55-2013)

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

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

ANALYTICAL REPORT

Bacteriological Tests - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2706126-1 Sample Date: 12-MAY-22 Sample ID: BH3
E. Coli	CFU/100mL	-	200	0

Guide Limit #1: Durham Sanitary Sewer (55-2013)
Guide Limit #2: Durham Storm Sewer - (55-2013)

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

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

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2706126-1 Sample Date: 12-MAY-22 Sample ID: BH3
Aluminum (Al)-Total	mg/L	50	-	0.296
Antimony (Sb)-Total	mg/L	5	-	0.00071
Arsenic (As)-Total	mg/L	1	0.02	0.00310
Cadmium (Cd)-Total	mg/L	0.7	0.008	<0.000010
Chromium (Cr)-Total	mg/L	2	0.08	0.00067
Cobalt (Co)-Total	mg/L	5	-	0.00032
Copper (Cu)-Total	mg/L	3	0.05	0.0018
Lead (Pb)-Total	mg/L	1	0.12	0.00029
Manganese (Mn)-Total	mg/L	5	0.15	0.0217
Mercury (Hg)-Total	mg/L	0.01	0.0004	<0.0000050
Molybdenum (Mo)-Total	mg/L	5	-	0.0298
Nickel (Ni)-Total	mg/L	2	0.08	0.00103
Selenium (Se)-Total	mg/L	1	0.02	0.000187
Silver (Ag)-Total	mg/L	5	0.12	0.000089
Tin (Sn)-Total	mg/L	5	-	0.00387
Titanium (Ti)-Total	mg/L	5	-	0.00774
Zinc (Zn)-Total	mg/L	2	0.04	<0.0030

Guide Limit #1: Durham Sanitary Sewer (55-2013)
Guide Limit #2: Durham Storm Sewer - (55-2013)

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

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

ANALYTICAL REPORT

Aggregate Organics - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2706126-1 Sample Date: 12-MAY-22 Sample ID: BH3
BOD	mg/L	300	15	<3.0 BODL
Oil and Grease, Total	mg/L	-	-	<5.0
Animal/Veg Oil & Grease	mg/L	150	-	<5.0
Mineral Oil and Grease	mg/L	15	-	<2.5
Phenols (4AAP)	mg/L	1	0.008	<0.0010

Guide Limit #1: Durham Sanitary Sewer (55-2013)
Guide Limit #2: Durham Storm Sewer - (55-2013)

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

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

Volatile Organic Compounds - WATER

			Lab ID	L2706126-1
			Sample Date	12-MAY-22
			Sample ID	BH3
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Benzene	ug/L	10	2	<0.50
Chloroform	ug/L	40	2	<1.0
1,2-Dichlorobenzene	ug/L	50	5.6	<0.50
1,4-Dichlorobenzene	ug/L	80	6.8	<0.50
cis-1,2-Dichloroethylene	ug/L	4000	5.6	<0.50
Dichloromethane	ug/L	2000	5.2	<2.0
trans-1,3-Dichloropropene	ug/L	140	5.6	<0.50
Ethylbenzene	ug/L	160	2	<0.50
Methyl Ethyl Ketone	ug/L	8000	-	<20
Styrene	ug/L	200	-	<0.50
1,1,2,2-Tetrachloroethane	ug/L	1400	17	<0.50
Tetrachloroethylene	ug/L	1000	4.4	<0.50
Toluene	ug/L	270	2	<0.50
Trichloroethylene	ug/L	400	8	<0.50
o-Xylene	ug/L	-	-	<0.50
m+p-Xylenes	ug/L	-	-	<1.0
Xylenes (Total)	ug/L	1400	4.4	<1.1
Surrogate: 4-Bromofluorobenzene	%	-	-	94.4
Surrogate: 1,4-Difluorobenzene	%	-	-	101.2

Guide Limit #1: Durham Sanitary Sewer (55-2013)
Guide Limit #2: Durham Storm Sewer - (55-2013)

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

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

ANALYTICAL REPORT

Phthalate Esters - WATER

			Lab ID	L2706126-1
			Sample Date	12-MAY-22
			Sample ID	BH3
		Guide Limits		
Analyte	Unit	#1	#2	
Bis(2-ethylhexyl)phthalate	ug/L	12	8.8	<2.0
Surrogate: 2-fluorobiphenyl	%	-	-	87.8
Surrogate: p-Terphenyl d14	%	-	-	102.2

Guide Limit #1: Durham Sanitary Sewer (55-2013)
Guide Limit #2: Durham Storm Sewer - (55-2013)

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

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

ANALYTICAL REPORT

Semi-Volatile Organics - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2706126-1 Sample Date: 12-MAY-22 Sample ID: BH3
Di-n-butylphthalate	ug/L	80	15	1.7
Surrogate: 2-Fluorobiphenyl	%	-	-	87.8
Surrogate: p-Terphenyl d14	%	-	-	102.2

Guide Limit #1: Durham Sanitary Sewer (55-2013)
Guide Limit #2: Durham Storm Sewer - (55-2013)

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

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

ANALYTICAL REPORT

Polychlorinated Biphenyls - WATER

			Lab ID	L2706126-1
			Sample Date	12-MAY-22
			Sample ID	BH3
		Guide Limits		
Analyte	Unit	#1	#2	
Aroclor 1242	ug/L	-	-	<0.020
Aroclor 1248	ug/L	-	-	<0.020
Aroclor 1254	ug/L	-	-	<0.020
Aroclor 1260	ug/L	-	-	<0.020
Surrogate: Decachlorobiphenyl	%	-	-	142.7
Total PCBs	ug/L	1	0.4	<0.040
Surrogate: Tetrachloro-m-xylene	%	-	-	99.2

Guide Limit #1: Durham Sanitary Sewer (55-2013)
Guide Limit #2: Durham Storm Sewer - (55-2013)

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

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

ANALYTICAL REPORT

Organic Parameters - WATER

			Lab ID	L2706126-1
			Sample Date	12-MAY-22
			Sample ID	BH3
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Nonylphenol	ug/L	20	-	10.9
Nonylphenol Diethoxylates	ug/L	-	-	<0.10
Total Nonylphenol Ethoxylates	ug/L	200	-	<2.0
Nonylphenol Monoethoxylates	ug/L	-	-	<2.0

Guide Limit #1: Durham Sanitary Sewer (55-2013)
Guide Limit #2: Durham Storm Sewer - (55-2013)

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

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

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
CINT	Cooling initiated. Samples were received packed with ice or ice packs and were sampled the same day as received.

Qualifiers for Individual Parameters Listed:

Qualifier	Description
PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis
BODL	Limit of Reporting for BOD was increased to account for the largest volume of sample tested.

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
625-BIS-2-PHTH-WT	Water	Bis(2-ethylhexyl)phthalate	SW846 8270
Aqueous samples are extracted and extracts are analyzed on GC/MSD.			
625-DNB-PHTH-WT	Water	Di-n-Butyl Phthalate	SW846 8270
Aqueous samples are extracted and extracts are analyzed on GC/MSD.			
BOD-WT	Water	BOD	APHA 5210 B
This analysis is carried out using procedures adapted from APHA Method 5210B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2
Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.			
When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference			
EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
EC-WW-MF-WT	Water	E. Coli	SM 9222D
A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200			
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.			
MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
NP,NPE-LCMS-WT	Water	Nonylphenols and Ethoxylates by LC/MS-MS	J. Chrom A849 (1999) p.467-482

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

Water samples are filtered and analyzed on LCMS/MS by direct injection.

OGG-SPEC-CALC-WT	Water	Speciated Oil and Grease A/V Calc	CALCULATION

Sample is extracted with hexane, sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.

OGG-SPEC-WT	Water	Speciated Oil and Grease-Gravimetric	APHA 5520 B

The procedure involves an extraction of the entire water sample with hexane. Sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PCB-WT	Water	Polychlorinated Biphenyls	EPA 8082

PCBs are extracted from an aqueous sample at neutral pH with aliquots of dichloromethane using a modified separatory funnel technique. The extracts are analyzed by GC/MSD.

PH-WT	Water	pH	APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

PHENOLS-4AAP-WT	Water	Phenol (4AAP)	EPA 9066

An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.

SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TKN-F-WT	Water	TKN in Water by Fluorescence	J. ENVIRON. MONIT., 2005,7,37-42,RSC

Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection

VOC-ROU-HS-WT	Water	Volatile Organic Compounds	SW846 8260

Aqueous samples are analyzed by headspace-GC/MS.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

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

Chain of Custody Numbers:

20-951299

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

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

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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

Quality Control Report

Workorder: L2706126 Report Date: 25-MAY-22

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

Contact: Sam Baston

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
625-BIS-2-PHTH-WT	**Water**							
Batch R5785171								
WG3727801-2 LCS								
Bis(2-ethylhexyl)phthalate			119.3		%		50-140	19-MAY-22
WG3727801-1 MB								
Bis(2-ethylhexyl)phthalate			<2.0		ug/L		2	19-MAY-22
Surrogate: 2-fluorobiphenyl			93.9		%		40-130	19-MAY-22
Surrogate: p-Terphenyl d14			107.0		%		40-130	19-MAY-22
625-DNB-PHTH-WT	**Water**							
Batch R5785171								
WG3727801-2 LCS								
Di-n-butylphthalate			106.2		%		50-150	19-MAY-22
WG3727801-1 MB								
Di-n-butylphthalate			<1.0		ug/L		1	19-MAY-22
Surrogate: 2-Fluorobiphenyl			93.9		%		40-130	19-MAY-22
Surrogate: p-Terphenyl d14			107.0		%		40-130	19-MAY-22
BOD-WT	**Water**							
Batch R5785270								
WG3727454-2 DUP		**L2706137-1**						
BOD		<3.0	<3.0	RPD-NA	mg/L	N/A	30	14-MAY-22
WG3727454-3 LCS								
BOD			91.9		%		85-115	14-MAY-22
WG3727454-1 MB								
BOD			<2.0		mg/L		2	14-MAY-22
CN-TOT-WT	**Water**							
Batch R5784019								
WG3728528-3 DUP		**WG3728528-5**						
Cyanide, Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	17-MAY-22
WG3728528-2 LCS								
Cyanide, Total			105.1		%		80-120	17-MAY-22
WG3728528-1 MB								
Cyanide, Total			<0.0020		mg/L		0.002	17-MAY-22
WG3728528-4 MS		**WG3728528-5**						
Cyanide, Total			89.0		%		70-130	17-MAY-22
EC-WW-MF-WT	**Water**							
Batch R5780478								
WG3727377-1 MB								
E. Coli			0		CFU/100mL		1	14-MAY-22

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-WT	**Water**							
Batch R5784093								
WG3728239-4 DUP		**WG3728239-3**						
Fluoride (F)		0.073	0.073		mg/L	0.1	20	17-MAY-22
WG3728239-2 LCS								
Fluoride (F)			102.0		%		90-110	17-MAY-22
WG3728239-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	17-MAY-22
WG3728239-5 MS		**WG3728239-3**						
Fluoride (F)			95.3		%		75-125	17-MAY-22
HG-T-CVAA-WT	**Water**							
Batch R5781344								
WG3727585-3 DUP		**WG3727585-5**						
Mercury (Hg)-Total		<0.0000050	<0.000005(	RPD-NA	mg/L	N/A	20	16-MAY-22
WG3727585-2 LCS								
Mercury (Hg)-Total			99.2		%		80-120	16-MAY-22
WG3727585-1 MB								
Mercury (Hg)-Total			<0.000005(		mg/L		0.000005	16-MAY-22
WG3727585-4 MS		**WG3727585-6**						
Mercury (Hg)-Total			91.3		%		70-130	16-MAY-22
MET-T-CCMS-WT	**Water**							
Batch R5781260								
WG3727506-4 DUP		**WG3727506-3**						
Aluminum (Al)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	16-MAY-22
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAY-22
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAY-22
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	16-MAY-22
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-MAY-22
Cobalt (Co)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAY-22
Copper (Cu)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-MAY-22
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	16-MAY-22
Manganese (Mn)-Total		0.105	0.105		mg/L	0.2	20	16-MAY-22
Molybdenum (Mo)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	16-MAY-22
Nickel (Ni)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	16-MAY-22
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	16-MAY-22
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	16-MAY-22
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	16-MAY-22
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	16-MAY-22

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5781260								
WG3727506-4 DUP		**WG3727506-3**						
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	16-MAY-22
WG3727506-2 LCS								
Aluminum (Al)-Total			92.1		%		80-120	16-MAY-22
Antimony (Sb)-Total			98.5		%		80-120	16-MAY-22
Arsenic (As)-Total			95.0		%		80-120	16-MAY-22
Cadmium (Cd)-Total			95.1		%		80-120	16-MAY-22
Chromium (Cr)-Total			92.8		%		80-120	16-MAY-22
Cobalt (Co)-Total			94.5		%		80-120	16-MAY-22
Copper (Cu)-Total			92.6		%		80-120	16-MAY-22
Lead (Pb)-Total			98.7		%		80-120	16-MAY-22
Manganese (Mn)-Total			94.8		%		80-120	16-MAY-22
Molybdenum (Mo)-Total			92.0		%		80-120	16-MAY-22
Nickel (Ni)-Total			94.3		%		80-120	16-MAY-22
Selenium (Se)-Total			94.1		%		80-120	16-MAY-22
Silver (Ag)-Total			89.8		%		80-120	16-MAY-22
Tin (Sn)-Total			95.5		%		80-120	16-MAY-22
Titanium (Ti)-Total			87.4		%		80-120	16-MAY-22
Zinc (Zn)-Total			91.5		%		80-120	16-MAY-22
WG3727506-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	16-MAY-22
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	16-MAY-22
Arsenic (As)-Total			<0.00010		mg/L		0.0001	16-MAY-22
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	16-MAY-22
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	16-MAY-22
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	16-MAY-22
Copper (Cu)-Total			<0.00050		mg/L		0.0005	16-MAY-22
Lead (Pb)-Total			<0.000050		mg/L		0.00005	16-MAY-22
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	16-MAY-22
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	16-MAY-22
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	16-MAY-22
Selenium (Se)-Total			<0.000050		mg/L		0.00005	16-MAY-22
Silver (Ag)-Total			<0.000050		mg/L		0.00005	16-MAY-22
Tin (Sn)-Total			<0.00010		mg/L		0.0001	16-MAY-22
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	16-MAY-22

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5781260								
WG3727506-1 MB								
Zinc (Zn)-Total			<0.0030		mg/L		0.003	16-MAY-22
WG3727506-5 MS		**WG3727506-6**						
Aluminum (Al)-Total			95.9		%		70-130	16-MAY-22
Antimony (Sb)-Total			N/A	MS-B	%		-	16-MAY-22
Arsenic (As)-Total			100.2		%		70-130	16-MAY-22
Cadmium (Cd)-Total			99.0		%		70-130	16-MAY-22
Chromium (Cr)-Total			102.1		%		70-130	16-MAY-22
Cobalt (Co)-Total			N/A	MS-B	%		-	16-MAY-22
Copper (Cu)-Total			N/A	MS-B	%		-	16-MAY-22
Lead (Pb)-Total			100.1		%		70-130	16-MAY-22
Manganese (Mn)-Total			N/A	MS-B	%		-	16-MAY-22
Molybdenum (Mo)-Total			N/A	MS-B	%		-	16-MAY-22
Nickel (Ni)-Total			95.1		%		70-130	16-MAY-22
Selenium (Se)-Total			102.5		%		70-130	16-MAY-22
Silver (Ag)-Total			87.0		%		70-130	16-MAY-22
Tin (Sn)-Total			98.2		%		70-130	16-MAY-22
Titanium (Ti)-Total			98.1		%		70-130	16-MAY-22
Zinc (Zn)-Total			97.2		%		70-130	16-MAY-22
NP,NPE-LCMS-WT	**Water**							
Batch R5784526								
WG3727734-3 DUP		**L2706038-1**						
Nonylphenol		<1.0	<1.0	RPD-NA	ug/L	N/A	30	17-MAY-22
Nonylphenol Monoethoxylates		<2.0	<2.0	RPD-NA	ug/L	N/A	30	17-MAY-22
Nonylphenol Diethoxylates		<0.10	<0.10	RPD-NA	ug/L	N/A	30	17-MAY-22
WG3727734-2 LCS								
Nonylphenol			94.8		%		75-125	17-MAY-22
Nonylphenol Monoethoxylates			95.2		%		75-125	17-MAY-22
Nonylphenol Diethoxylates			99.5		%		75-125	17-MAY-22
WG3727734-1 MB								
Nonylphenol			<1.0		ug/L		1	17-MAY-22
Nonylphenol Monoethoxylates			<2.0		ug/L		2	17-MAY-22
Nonylphenol Diethoxylates			<0.10		ug/L		0.1	17-MAY-22
WG3727734-4 MS		**L2706038-1**						
Nonylphenol			143.4	K	%		60-140	17-MAY-22

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NP,NPE-LCMS-WT	**Water**							
Batch R5784526								
WG3727734-4 MS		**L2706038-1**						
Nonylphenol Monoethoxylates			151.4	K	%		60-140	17-MAY-22
Nonylphenol Diethoxylates			85.7		%		60-140	17-MAY-22
OGG-SPEC-WT	**Water**							
Batch R5786461								
WG3729220-2 LCS								
Oil and Grease, Total			103.3		%		70-130	19-MAY-22
Mineral Oil and Grease			96.5		%		70-130	19-MAY-22
WG3729220-1 MB								
Oil and Grease, Total			<5.0		mg/L		5	19-MAY-22
Mineral Oil and Grease			<2.5		mg/L		2.5	19-MAY-22
P-T-COL-WT	**Water**							
Batch R5782606								
WG3727658-3 DUP		**L2705650-8**						
Phosphorus, Total		0.0672	0.0555		mg/L	19	20	17-MAY-22
WG3727658-2 LCS								
Phosphorus, Total			97.3		%		80-120	17-MAY-22
WG3727658-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	17-MAY-22
WG3727658-4 MS		**L2705650-8**						
Phosphorus, Total			73.5		%		70-130	17-MAY-22
PCB-WT	**Water**							
Batch R5783805								
WG3728580-2 LCS								
Aroclor 1242			95.0		%		65-130	18-MAY-22
Aroclor 1248			99.6		%		65-130	18-MAY-22
Aroclor 1254			91.9		%		65-130	18-MAY-22
Aroclor 1260			93.8		%		65-130	18-MAY-22
WG3728580-1 MB								
Aroclor 1242			<0.020		ug/L		0.02	18-MAY-22
Aroclor 1248			<0.020		ug/L		0.02	18-MAY-22
Aroclor 1254			<0.020		ug/L		0.02	18-MAY-22
Aroclor 1260			<0.020		ug/L		0.02	18-MAY-22
Surrogate: Decachlorobiphenyl			111.9		%		50-150	18-MAY-22
Surrogate: Tetrachloro-m-xylene			97.0		%		50-150	18-MAY-22
PH-WT	**Water**							

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-WT	**Water**							
Batch R5783717								
WG3728172-4 DUP		**WG3728172-3**						
pH		8.37	8.21	J	pH units	0.16	0.2	17-MAY-22
WG3728172-2 LCS								
pH			7.06		pH units		6.9-7.1	17-MAY-22
PHENOLS-4AAP-WT	**Water**							
Batch R5782879								
WG3727762-2 LCS								
Phenols (4AAP)			101.5		%		85-115	16-MAY-22
WG3727762-1 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	16-MAY-22
SO4-IC-N-WT	**Water**							
Batch R5784093								
WG3728239-4 DUP		**WG3728239-3**						
Sulfate (SO4)		55.8	55.8		mg/L	0.0	20	17-MAY-22
WG3728239-2 LCS								
Sulfate (SO4)			102.7		%		90-110	17-MAY-22
WG3728239-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	17-MAY-22
WG3728239-5 MS		**WG3728239-3**						
Sulfate (SO4)			105.6		%		75-125	17-MAY-22
SOLIDS-TSS-WT	**Water**							
Batch R5780957								
WG3727479-3 DUP		**L2706250-1**						
Total Suspended Solids		72.0	73.0		mg/L	1.4	20	16-MAY-22
WG3727479-2 LCS								
Total Suspended Solids			106.7		%		85-115	16-MAY-22
WG3727479-1 MB								
Total Suspended Solids			<3.0		mg/L		3	16-MAY-22
TKN-F-WT	**Water**							
Batch R5784167								
WG3727736-3 DUP		**WG3727736-5**						
Total Kjeldahl Nitrogen		0.796	0.726		mg/L	9.2	20	17-MAY-22
WG3727736-2 LCS								
Total Kjeldahl Nitrogen			101.3		%		75-125	17-MAY-22
WG3727736-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-MAY-22
WG3727736-4 MS		**WG3727736-5**						

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-F-WT	**Water**							
Batch R5784167								
WG3727736-4 MS		**WG3727736-5**						
Total Kjeldahl Nitrogen			99.2		%		70-130	17-MAY-22
VOC-ROU-HS-WT	**Water**							
Batch R5784216								
WG3728330-4 DUP		**WG3728330-3**						
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-MAY-22
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-MAY-22
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-MAY-22
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-MAY-22
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	18-MAY-22
cis-1,2-Dichloroethylene		0.67	0.67		ug/L	0.0	30	18-MAY-22
Dichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	18-MAY-22
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-MAY-22
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	18-MAY-22
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	18-MAY-22
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	18-MAY-22
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-MAY-22
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	18-MAY-22
Toluene		<0.40	<0.40	RPD-NA	ug/L	N/A	30	18-MAY-22
trans-1,3-Dichloropropene		<0.50	<0.30	RPD-NA	ug/L	N/A	30	18-MAY-22
Trichloroethylene		4.52	4.61		ug/L	2.0	30	18-MAY-22
WG3728330-1 LCS								
1,1,2,2-Tetrachloroethane			95.1		%		70-130	17-MAY-22
1,2-Dichlorobenzene			105.2		%		70-130	17-MAY-22
1,4-Dichlorobenzene			106.4		%		70-130	17-MAY-22
Benzene			95.2		%		70-130	17-MAY-22
Chloroform			106.5		%		70-130	17-MAY-22
cis-1,2-Dichloroethylene			109.5		%		70-130	17-MAY-22
Dichloromethane			111.4		%		70-130	17-MAY-22
Ethylbenzene			95.0		%		70-130	17-MAY-22
m+p-Xylenes			101.3		%		70-130	17-MAY-22
Methyl Ethyl Ketone			97.0		%		60-140	17-MAY-22
o-Xylene			95.3		%		70-130	17-MAY-22
Styrene			83.7		%		70-130	17-MAY-22

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5784216								
WG3728330-1 LCS								
Tetrachloroethylene			95.1		%		70-130	17-MAY-22
Toluene			97.1		%		70-130	17-MAY-22
trans-1,3-Dichloropropene			62.7	MES	%		70-130	17-MAY-22
Trichloroethylene			100.2		%		70-130	17-MAY-22
WG3728330-2 MB								
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	17-MAY-22
1,2-Dichlorobenzene			<0.50		ug/L		0.5	17-MAY-22
1,4-Dichlorobenzene			<0.50		ug/L		0.5	17-MAY-22
Benzene			<0.50		ug/L		0.5	17-MAY-22
Chloroform			<1.0		ug/L		1	17-MAY-22
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	17-MAY-22
Dichloromethane			<2.0		ug/L		2	17-MAY-22
Ethylbenzene			<0.50		ug/L		0.5	17-MAY-22
m+p-Xylenes			<0.40		ug/L		0.4	17-MAY-22
Methyl Ethyl Ketone			<20		ug/L		20	17-MAY-22
o-Xylene			<0.30		ug/L		0.3	17-MAY-22
Styrene			<0.50		ug/L		0.5	17-MAY-22
Tetrachloroethylene			<0.50		ug/L		0.5	17-MAY-22
Toluene			<0.40		ug/L		0.4	17-MAY-22
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	17-MAY-22
Trichloroethylene			<0.50		ug/L		0.5	17-MAY-22
Surrogate: 1,4-Difluorobenzene			101.3		%		70-130	17-MAY-22
Surrogate: 4-Bromofluorobenzene			93.0		%		70-130	17-MAY-22
WG3728330-5 MS		**WG3728330-3**						
1,1,2,2-Tetrachloroethane			95.2		%		50-150	18-MAY-22
1,2-Dichlorobenzene			104.3		%		50-150	18-MAY-22
1,4-Dichlorobenzene			104.2		%		50-150	18-MAY-22
Benzene			92.5		%		50-150	18-MAY-22
Chloroform			108.5		%		50-150	18-MAY-22
cis-1,2-Dichloroethylene			107.3		%		50-150	18-MAY-22
Dichloromethane			113.1		%		50-150	18-MAY-22
Ethylbenzene			91.5		%		50-150	18-MAY-22
m+p-Xylenes			98.9		%		50-150	18-MAY-22
Methyl Ethyl Ketone			83.9		%		50-150	18-MAY-22

Quality Control Report

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

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5784216								
WG3728330-5 MS		**WG3728330-3**						
o-Xylene			92.7		%		50-150	18-MAY-22
Styrene			80.4		%		50-150	18-MAY-22
Tetrachloroethylene			91.2		%		50-150	18-MAY-22
Toluene			92.4		%		50-150	18-MAY-22
trans-1,3-Dichloropropene			78.2		%		50-150	18-MAY-22
Trichloroethylene			102.1		%		50-150	18-MAY-22

Quality Control Report

Workorder: L2706126 Report Date: 25-MAY-22

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

Legend:

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

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L2706126 Report Date: 25-MAY-22

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

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH							
	1	12-MAY-22 10:00	17-MAY-22 00:00	4	5	days	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2706126 were received on 12-MAY-22 16:30.

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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

Chain of Custody (COC) / Analytical Re

L2706126-COFC

- 951299

of

ALS www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Report To	Contact and company name below will appear on the final report	Reports / Recipients	Turnaround Time (TAT) Requested
Company:	Grounded Engineering	Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)	☑ Routine [R] if received by 3pm M-F - no surcharges apply
Contact:	Sam Boston	Merge QC/QCI Reports with COA ☐ YES ☐ NO ☐ N/A	☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum
Phone:	647-981-3591	☑ Compare Results to Criteria on Report - provide details below if box checked	☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum
Street:	1 Bangor Dr	Email 1 or Fax sboston@groundedengi.ca	☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum
City/Province:	Toronto / ON	Email 2	☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests
Postal Code:	M4H 1G3	Email 3	Date and Time Required for all E&P TATs:
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Recipients	For all tests with rush TATs requested, please contact your AM to confirm availability.
	Copy of Invoice with Report ☑ YES ☐ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax	
Contact:	sboston@groundedengi.ca	Email 2	

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	22-058	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (ALS use only):	L2706126 JD	ALS Contact:	Sampler: LB

Analysis Request

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

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Dunham Region Sanitary and Storm (Combined)	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	BH 3	12-May-22	10:00	GW	16	F			

Drinking Water (DW) Samples[1] (client use)	Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO	Dunham Region Sanitary and Storm (Combined)
Are samples for human consumption/ use? ☐ YES ☐ NO	

SAMPLE RECEIPT DETAILS (ALS use only)

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

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

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

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
11.9							

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: LB	Date: May 12/22	Time: 4:30	Received by: JS	Date: May 12/22	Time: 16:30	Received by:	Date: 5/13/22	Time: 1800

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

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

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

APPENDIX G

Equivalent Well Radius (TOWNHOUSE 1)

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

r_s	=	$(a+b)/3.14$	applies when a/b <1.5 and R_0>>rs

r_s	=	$((a*b)/3.14)^{0.5}$

Q	=	$\frac{3.14*K*(H^2-h_w^2)}{\ln(R_0/r_s)}$

Ground Surface	99.85	masl
Highest Water Level	98.7	masl
Base of Excavation	96.55	masl
Drawdown Target	95.7	masl
Aquifer Bottom	95.7	masl
Rain Fall	0.030	m
Factor of Saftey	2.0	
Hydrualic Gradient	1	
K =	1.00E-05	m/s
H =	3.0	m
h_w =	0.0	m
dH =	3.0	m
$R_{0=}$	28.5	m
r_s+ $R_{0=}$	35	m
a =	12	m
b =	8	m
$r_{s=}$	6	m

SHORT TERM		
Summary	**L/day**	**L/min**
Groundwater	30,000	20.8
Rainfall	2,880	2.0
Total	32,880	22.8

100 year storm event (L/day): **10,000**

LONG TERM		
Summary	**L/day**	**L/min**
Groundwater	30,000	20.8
Infiltration	3,000	2.1
Total	33,000	22.9

Legend:

K = Hydraulic Conductivity
H = Depth from static wate table to the assumed aquifer bottom
h_w = Depth from the dewatering target to the assumed aquifer bottom
dH = Dewatering thickness
a = Length of Excavation
b = Width of Excavation

Reference: J. Patrick Powers... [et al.] (2007), "Construction Dewatering and Groundwater Control: New Methods and Applications, 3rd ed." Wiley, Hoboken, NJ.

Equivalent Well Radius (TOWNHOUSE 2)

R_0	=	$3000*dH*K^{0.5}$
r_s	=	$(a+b)/3.14$
r_s	=	$((a*b)/3.14)^{0.5}$
Q	=	$\frac{3.14*K*(H^2-h_w^2)}{\ln(R_0/r_s)}$

applies when a/b <1.5 and R_0>>rs

Ground Surface	99.85	masl
Highest Water Level	98.7	masl
Base of Excavation	96.55	masl
Drawdown Target	95.7	masl
Aquifer Bottom	95.7	masl
Rain Fall	0.030	m
Factor of Saftey	2.0	
Hydrualic Gradient	1	
K =	1.00E-05	m/s
H =	3.0	m
h_w =	0.0	m
dH =	3.0	m
$R_{0=}$	28.5	m
r_s+ $R_{0=}$	35	m
a =	12	m
b =	8	m
$r_{s=}$	6	m

SHORT TERM		
Summary	**L/day**	**L/min**
Groundwater	30,000	20.8
Rainfall	2,880	2.0
Total	32,880	22.8

100 year storm event (L/day): 10,000

LONG TERM		
Summary	**L/day**	**L/min**
Groundwater	30,000	20.8
Infiltration	3,000	2.1
Total	33,000	22.9

Legend:

K = Hydraulic Conductivity
H = Depth from static wate table to the assumed aquifer bottom
h_w = Depth from the dewatering target to the assumed aquifer bottom
dH = Dewatering thickness
a = Length of Excavation
b = Width of Excavation

Reference: J. Patrick Powers... [et al.] (2007), "Construction Dewatering and Groundwater Control: New Methods and Applications, 3rd ed." Wiley, Hoboken, NJ.

SHORT TERM - 1 BASEMENT LEVEL (TOWNHOUSE 3)

Excavation Dimensions [m]	
N-S	8
E-W	12
Area (m2)	96
Perimeter (m)	40

Rainfall Data		
Year	2	100
Hour	3	12
Depth (mm)	30	98
Depth (m)	0.03	0.098

Section		Flow [m3/day]	Length [m]	Volume [L/day]
Base		0	8	-
Sides		0	40	-
Total				-
Factor of Safety	2.0			-

Storm Events	
2 Year [L/day]	100 Year [L/day]
2,880	10,000

Summary	L/day	L/min
Groundwater	-	-
Rainfall	3,000	2.1
Total	3,000	2.1

LONG TERM - 1 BASEMENT LEVEL (TOWNHOUSE 3)

Excavation Dimensions [m]	
N-S	8
E-W	12
Area (m2)	96
Perimeter (m)	40

Rainfall Data		
Year	2	100
Hour	3	12
Depth (mm)	30	98
Depth (m)	0.03	0.098

Section		Flow [m3/day]	Length [m]	Volume [L/day]
Base		0	8	-
Sides		0	40	-
Total				-
Factor of Safety	2.0			-

Infiltration [L/day]
1915.2

Summary	L/day	L/min
Groundwater	-	-
Infiltration	3,000	2.1
Total	3,000	2.1

SHORT TERM - 1 BASEMENT LEVEL (TOWNHOUSE 4)

Excavation Dimensions [m]	
N-S	8
E-W	12
Area (m2)	96
Perimeter (m)	40

Rainfall Data		
Year	2	100
Hour	3	12
Depth (mm)	30	98
Depth (m)	0.03	0.098

Section		Flow [m3/day]	Length [m]	Volume [L/day]
Base		0	8	-
Sides		0	40	-
Total				-
Factor of Safety	2.0			-

Storm Events	
2 Year [L/day]	100 Year [L/day]
2,880	10,000

Summary	L/day	L/min
Groundwater	-	-
Rainfall	3,000	2.1
Total	3,000	2.1

LONG TERM - 1 BASEMENT LEVEL (TOWNHOUSE 4)

Excavation Dimensions [m]	
N-S	8
E-W	12
Area (m2)	96
Perimeter (m)	40

Rainfall Data		
Year	2	100
Hour	3	12
Depth (mm)	30	98
Depth (m)	0.03	0.098

Section		Flow [m3/day]	Length [m]	Volume [L/day]
Base		0	8	-
Sides		0	40	-
Total				-
Factor of Safety	2.0			-

Infiltration [L/day]
1897.2

Summary	L/day	L/min
Groundwater	-	-
Infiltration	3,000	2.1
Total	3,000	2.1

Equivalent Well Radius (TOWNHOUSE 5)

R_0	=	$3000*dH*K^{0.5}$
r_s	=	$(a+b)/3.14$
r_s	=	$((a*b)/3.14)^{0.5}$
Q	=	$\frac{3.14*K*(H^2-h_w^2)}{\ln(R_0/r_s)}$

applies when a/b <1.5 and R_0>>rs

Ground Surface	96.22	masl
Highest Water Level	95.8	masl
Base of Excavation	92.92	masl
Drawdown Target	91.2	masl
Aquifer Bottom	80	masl
Rain Fall	0.030	m
Factor of Saftey	2.0	
Hydrualic Gradient	1	
K =	7.21E-09	m/s
H =	15.8	m
h_w =	11.2	m
dH =	4.6	m
$R_{0=}$	1.2	m
r_s+ $R_{0=}$	8	m
a =	12	m
b =	8	m
$r_{s=}$	6	m

SHORT TERM		
Summary	**L/day**	**L/min**
Groundwater	4,000	2.8
Rainfall	2,880	2.0
Total	6,880	4.8

100 year storm event (L/day): **10,000**

LONG TERM		
Summary	**L/day**	**L/min**
Groundwater	4,000	2.8
Infiltration	3,000	2.1
Total	7,000	4.9

Legend:

K = Hydraulic Conductivity
H = Depth from static wate table to the assumed aquifer bottom
h_w = Depth from the dewatering target to the assumed aquifer bottom
dH = Dewatering thickness
a = Length of Excavation
b = Width of Excavation

Reference: J. Patrick Powers... [et al.] (2007), "Construction Dewatering and Groundwater Control: New Methods and Applications, 3rd ed." Wiley, Hoboken, NJ.