

HYDROGEOLOGICAL REVIEW REPORT

PREPARED FOR:
UPRC c/o Kindred Works
49 Bogert Ave.
Toronto, ON M2N 1K4

ATTENTION:
Edwin Cheng

**4094 Tomken Road,
Mississauga, Ontario**

Grounded Engineering Inc.
File No. 22-087
Issued August 31, 2022



Executive Summary

Grounded Engineering Inc. (Grounded) was retained by UPRC c/o Kindred Works to conduct a Hydrogeological Review for the proposed redevelopment of 4094 Tomken Road in Mississauga, Ontario. 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)	
4094 Tomken Road	1	2	Approx. 6	Approx. 129.0	Unknown.

Proposed Development					
Site	Above Grade Levels	Below Grade Levels			
		Level #	Lowest Finished Floor		Approximate Base of Foundations (masl)
			Depth (m)	Elevation (masl)	
North Building	13	3	Approx. 12	126.8	126.0
South Building	13	4	Approx. 13	125.7	125.0

Site Conditions

Site Stratigraphy					
Stratum/Formation	Aquifer or Aquitard	Depth Range (mbgs)	Elevation Range (masl)	Hydraulic Conductivity (m/s)	Method
Fill	Aquifer	0.1 to 1.5	136.7 to 138.0	1.0×10^{-5}	Literature ¹
Clayey Silt Till	Aquitard	0.8 to 3.8	134.2 to 137.2	5.0×10^{-9}	Grain size
Weathered Bedrock	Aquifer	3.0 to 7.5	130.4 to 134.9	1.0×10^{-6}	Slug test
Sound Bedrock	Aquitard	7.5	130.4	1.0×10^{-6}	Slug test

Groundwater Quality				
Sample ID	Sample Date	Sample Expiry Date	City of Mississauga Storm Sewer Limits	Region of Peel Sanitary and Combined Sewer Limits
SW-UF-BH2	June 14, 2022	N/A	Exceeds	Exceeds

¹ Freeze and Cherry (1979)



Groundwater Control

Stored Groundwater (pre-excavation/dewatering)						
	Volume of Excavation (m ³)	Volume of Excavation Below Water Table (m ³)	Estimated Volume of Stored Groundwater		Estimated Volume of Available Groundwater	
			m ³	L	m ³	L
North Building	18,498	12,016	1,500	1,500,000	900	900,000
South Building	34,816	23,664	2,700	2,700,000	1,700	1,700,000

North Building:

Short Term (Construction) Steady State Groundwater Quantity – Safety Factor of 2.0 Used					
Estimated Groundwater Seepage		Design Rainfall Event (25mm)		Estimated Total Daily Water Takings	
L/day	L/min	L/day	L/min	L/day	L/min
70,000	48.6	40,000	27.8	110,000	76.4

Long Term (Permanent) Steady State Groundwater Quantity – Safety Factor of 2.0 Used					
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
70,000	48.6	4,000	2.8	74,000	51.4

South Building:

Short Term (Construction) Steady State Groundwater Quantity – Safety Factor of 2.0 Used					
Estimated Groundwater Seepage		Design Rainfall Event (25mm)		Estimated Total Daily Water Takings	
L/day	L/min	L/day	L/min	L/day	L/min
125,000	86.8	68,000	47.2	193,000	134.0

Long Term (Permanent) Steady State Groundwater Quantity – Safety Factor of 2.0 Used					
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
125,000	86.8	11,000	7.6	136,000	94.4



Land Stability		
	Short Term (Construction)	Long Term (Permanent)
Maximum Zone of Influence (m)	26	26
Maximum Potential Settlement (mm)	0	0

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



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FIGURES

Figure 1 – Study Area Map

Figure 2 – Borehole and Monitoring Well Location Plan – Existing

Figure 3 – Borehole and Monitoring Well Location Plan – Proposed

Figure 4 – Proposed Underground Parking Structures

Figure 5 – Subsurface Cross-Section

APPENDICES

Appendix A – Borehole Logs

Appendix B – Aquifer Response Tests

Appendix C – Grain Size Analysis

Appendix D – HydrogeoSieveXL Data

Appendix E – Laboratory Certificate of Analysis

Appendix F – Finite Element Model

Appendix G – Dewatering Calculations



1 Introduction

UPRC c/o Kindred Works has retained Grounded Engineering Inc. (“Grounded”) to provide hydrogeological engineering design advice for their proposed development at 4094 Tomken Road, in Mississauga, Ontario.

Property Information	
Location of Site	4094 Tomken Road, Mississauga, Ontario, L4W 4H5
Ownership of Site	Trustees of the Westminster Congregation of The United Church of Canada
Site Dimensions (m)	124 x 81 (irregular shape)
Site Area (m ²)	10,000

Existing Development	
Number of Building Structures	2
Number of Above Grade Levels	1
Number of Underground Levels	2
Sub-Grade Depth of Development (m)	Approx. 6
Sub-Grade Area (m ²)	Approx. 900 each
Land Use Classification	Institutional

Proposed Development	
Number of Building Structures	2
Number of Above Grade Levels	North Building: 13 South Building: 13
Number of Underground Levels	North Building: 3 South Building: 4
Sub-Grade Depth of Development (m)	North Building: Approx 12 South Building: Approx 13
Sub-Grade Area (m ²)	North Building: 1,700 South Building: 2,750
Land Use Classification	Residential



Qualified Person and Hydrogeological Review Information

Qualified Person	Matthew Bielaski, P.Eng., QP ^{ESA/RA}
Consulting Firm	Grounded Engineering Inc.
Date of Hydrogeological Review	August 31, 2022
Scope of Work	<ul style="list-style-type: none"> ▪ 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 10.1 m, which were instrumented with 3 monitoring wells ▪ Completion of a 24 hour pump test (if feasible) ▪ Completion of slug tests in two available monitoring wells due to one well being dry ▪ Groundwater sampling and analysis to the City of Mississauga/Region of Peel Sewer Use Limits ▪ 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 138.0 masl.
Local Physiographic Features	The site is composed of fill overlying clayey silt glacial till deposits and consists of drumlinized till plains.
Regional Physiographic Features	The site is located in southern portion of the South Slope. The South Slope contains a variety of soils developed upon tills which are sandier in the east and clayey in the west. The South Slope is bounded in the north by the Oak Ridges and in the south by the Iroquois Plain.
Watershed	The site is located within the Etobicoke Creek Watershed. Locally, groundwater is anticipated to flow northeast towards a branch of Etobicoke Creek.
Surface Drainage	Surface water is expected to flow towards municipal catch basins located on or adjacent to the site, via Rathburn Road to the Northeast/Southwest or Tomken Road to the Northwest/Southeast.



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	0.1 to 1.5	136.7 to 138.0	1.0×10^{-5}	Literature ²
Clayey Silt Till	Aquitard	0.8 to 3.8	134.2 to 137.2	5.0×10^{-9}	Grain size

Bedrock				
Stratum/Formation	Depth Range (mbgs)	Elevation Range (masl)	Hydraulic Conductivity (m/s)	Method of Determination
Weathered	3.0 to 7.5	130.4 to 134.9	1.0×10^{-6}	Slug test
Sound	7.5	130.4	1.0×10^{-6}	Slug test

² Freeze and Cherry (1979)



Surface Water			
Surface Water Body	Distance from site (m)	Direction from site	Hydraulically Connected to Site (yes/no)
Etobicoke Creek	550	Northeast	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	137.9	130.9	127.8	Sound Bedrock
BH2	50	138	134.1	132.5	Weathered Bedrock
BH3	50	138.2	135.1	133.6	Weathered Bedrock

5 Groundwater Elevations

Well ID	Groundwater Elevation (masl)			
	June 14, 2022	June 27, 2022	July 29, 2022	Maximum
BH1	n/a	133.8	133.7	133.8
BH2	133.9	133.5	133.5	133.5
BH3	dry	133.9	133.7	133.9

For design purposes, the groundwater table is at Elev. 133.9 m in the bedrock.

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.

6 Aquifer Testing

6.1 Pump Test

A pumping test was not completed at the site. Due to the nature of the soil materials present and slow ground recharge of the aquifer it was not feasible to complete a 24-hour pumping test. Please note however that in-situ single well response tests were completed on each of the monitoring wells installed at the site.



6.2 Single Well Response Test (Slug Test)

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

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

Well ID	Well Screen Elevation (masl)	Screened Geological Unit	Hydraulic Conductivity (m/s)
BH1	130.9 - 127.8	Sound Bedrock	1.0×10^{-6}
BH2	134.1 - 132.5	Weathered Bedrock	4.4×10^{-7}
BH3	135.1 - 133.6	Weathered Bedrock	n/a

6.3 Soil Grain Size Distribution

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

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

Sample ID	Soil Description	Applicable Analysis Methods	Hydraulic Conductivity (m/s)
BH1 SS3	Clayey silt till	Alyamani and Sen, Barr, Sauerbrei	1.4×10^{-9}
BH2 SS2B	Clayey silt till	Alyamani and Sen, Barr, Sauerbrei	4.1×10^{-9}
BH3 SS5	Clayey silt till	Alyamani and Sen, Barr, Sauerbrei	5.0×10^{-9}

The results of the analyses are presented in Appendix D.

6.4 Literature

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



Stratum/Formation	Hydraulic Conductivity (m/s)
Earth Fill	10^{-2} to 10^{-6}
Silts	10^{-5} to 10^{-9}
Glacial Till	10^{-6} to 10^{-12}
Clays	10^{-9} to 10^{-12}
Bedrock (Shale)	10^{-6} to 10^{-13}

7 Water Quality

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

The sample was collected directly from monitoring well BH2 on June 14, 2022. The sample was analyzed for the following parameters:

- Mississauga Storm Sewer (0046-2022)
- STM Reg. Mun. of Peel Storm By-Law #53-2010

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

- Total Suspended Solids (Limit 15 mg/L, Result 177 mg/L)
- Total Kjeldahl Nitrogen (Limit 1 mg/L, Result 4.90 mg/L)
- Total Manganese (Limit 0.05 mg/L, Result 0.695 mg/L)
- Total Aluminum (Limit 1 mg/L, Result 4.18 mg/L)

The groundwater sample **exceeded** the **Limits for Sanitary and Combined Sewer Discharge** for the following parameters:

- Nonylphenols (Limit 20 µg/L, Result 77.9 µg/L)

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

8 Proposed Construction Method

For design purposes, the groundwater table is in the bedrock. This deposit has a very low permeability and will yield only minor seepage in the long term.



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

For design purposes, the stabilized groundwater table is at about Elev. 133.9± m. The groundwater table is present in bedrock. The lowest (P4) FFE is at about Elev. 125.7 m. Therefore,

- Bulk excavation will extend below the elevation of the design groundwater table.
- Foundation excavations will extend below the design groundwater table.

Excavations will generally be made below the groundwater table, in relatively medium-permeability bedrock of the Georgian Bay Formation.

On this basis, seepage into excavations may be allowed to drain into the excavation and then controlled by a conventional sump pump arrangement. Nevertheless, delays in excavation will occur as the seepage is controlled and these delays should be anticipated in the construction schedule.

Dewatering of the bedrock is not required, however, stored water within the excavation will need to be considered prior to excavation/dewatering.

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

9 Private Water Drainage System (PWDS)

If the proposed development consists of drained foundations, then a private water drainage system will be required. The total sub floor drain area will be approximately 4,450 m² based on the drawings which have been provided (1,700 m² for the North Building, and 2,750 m² for the south building).

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

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



10 Groundwater Extraction and Discharge

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

The groundwater seepage estimates, 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 for each excavation which will require removal before steady state is reached has been provided below.

Please note that if excavations are 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 for the North and South building in the occurrence of a 100-year storm event are approximately 149,000 L and 256,000L, respectively.

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)
Fill	1.0×10^{-5}
Clayey Silt Till	5.0×10^{-9}
Weathered Bedrock	1.0×10^{-6}
Sound Bedrock	1.0×10^{-6}



Groundwater Control

Stored Groundwater (pre-excavation/dewatering)						
	Volume of Excavation (m ³)	Volume of Excavation Below Water Table (m ³)	Estimated Volume of Stored Groundwater		Estimated Volume of Available Groundwater	
			m ³	L	m ³	L
North Building	18,498	12,016	1,500	1,500,000	900	900,000
South Building	34,816	23,664	2,700	2,700,000	1,700	1,700,000

North Building:

Short Term (Construction) Steady State Groundwater Quantity – Safety Factor of 2.0 Used					
Estimated Groundwater Seepage		Design Rainfall Event (25mm)		Estimated Total Daily Water Takings	
L/day	L/min	L/day	L/min	L/day	L/min
70,000	48.6	40,000	27.8	110,000	76.4

Long Term (Permanent) Steady State Groundwater Quantity – Safety Factor of 2.0 Used					
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
70,000	48.6	4,000	2.8	74,000	51.4

South Building:

Short Term (Construction) Steady State Groundwater Quantity – Safety Factor of 2.0 Used					
Estimated Groundwater Seepage		Design Rainfall Event (25mm)		Estimated Total Daily Water Takings	
L/day	L/min	L/day	L/min	L/day	L/min
125,000	86.8	68,000	47.2	193,000	134.0

Long Term (Permanent) Steady State Groundwater Quantity – Safety Factor of 2.0 Used					
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
125,000	86.8	11,000	7.6	136,000	94.4



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

Please note:

- The proposed pump schedule for short-term construction dewatering has not been completed. As such, the actual peak short term discharge rate is not available at the time of writing this report. The pump schedule must be specified by either the dewatering contractor retained or the mechanical consultant.
- The proposed pump schedule for long-term permanent drainage has not been completed. As such the actual peak long term discharge rate is not available at the time writing of this report. The pump schedule must be specified by the mechanical consultant.
- A watertight structure (structure that has not included a private water drainage system) has 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)	26	26

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)	8.2	8.2
Increase in Effective Stress (kPa)	80	80
Maximum Theoretical Settlement due to Dewatering (mm)	0	0
Public Realm Theoretical Settlement due to Dewatering (mm)	0	0

The 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 municipal/regional 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 the Limits for Sanitary and Combined Sewer Discharge.

As such additional treatment will be required before the water can be discharged to the Storm Sewer and additional treatment will be required before the water can be discharged to the Sanitary and Combined Sewer, to avoid impacts to the City and Regional sewage works caused by groundwater quality.



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 / Region'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 Mississauga. 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 Peel Region. 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. 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 c/o Kindred Works 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 Mississauga/Region of Peel may also make use of and rely upon this report, subject to the limitations as stated.

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,



Nico Piers, EIT
Project Coordinator



Matthew Bielaski, P.Eng., QP_{ESA/RA}
Principal

FIGURES





GROUND
ENGINEERING

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

LEGEND

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

Note

Reference

ArcGIS MyMaps 2021.

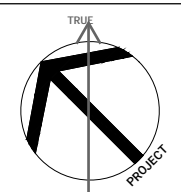
Project

**4094 Tomken Rd.,
Mississauga, ON,
L4W 1J5**

Figure Title

SITE LOCATION PLAN

North



Date

AUGUST 2022

Scale

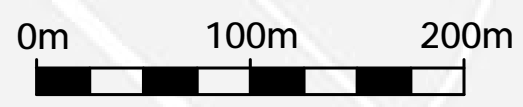
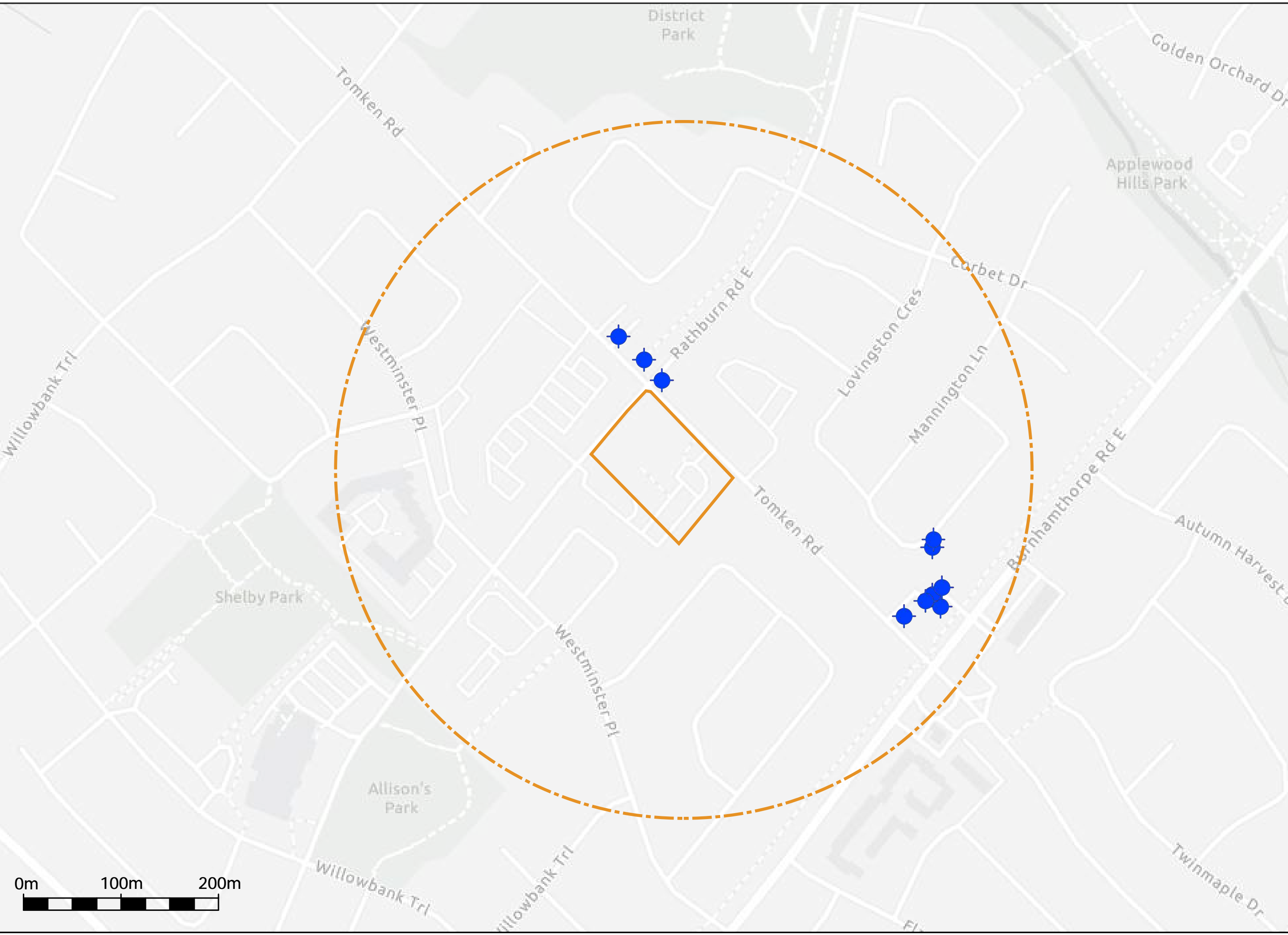
AS INDICATED

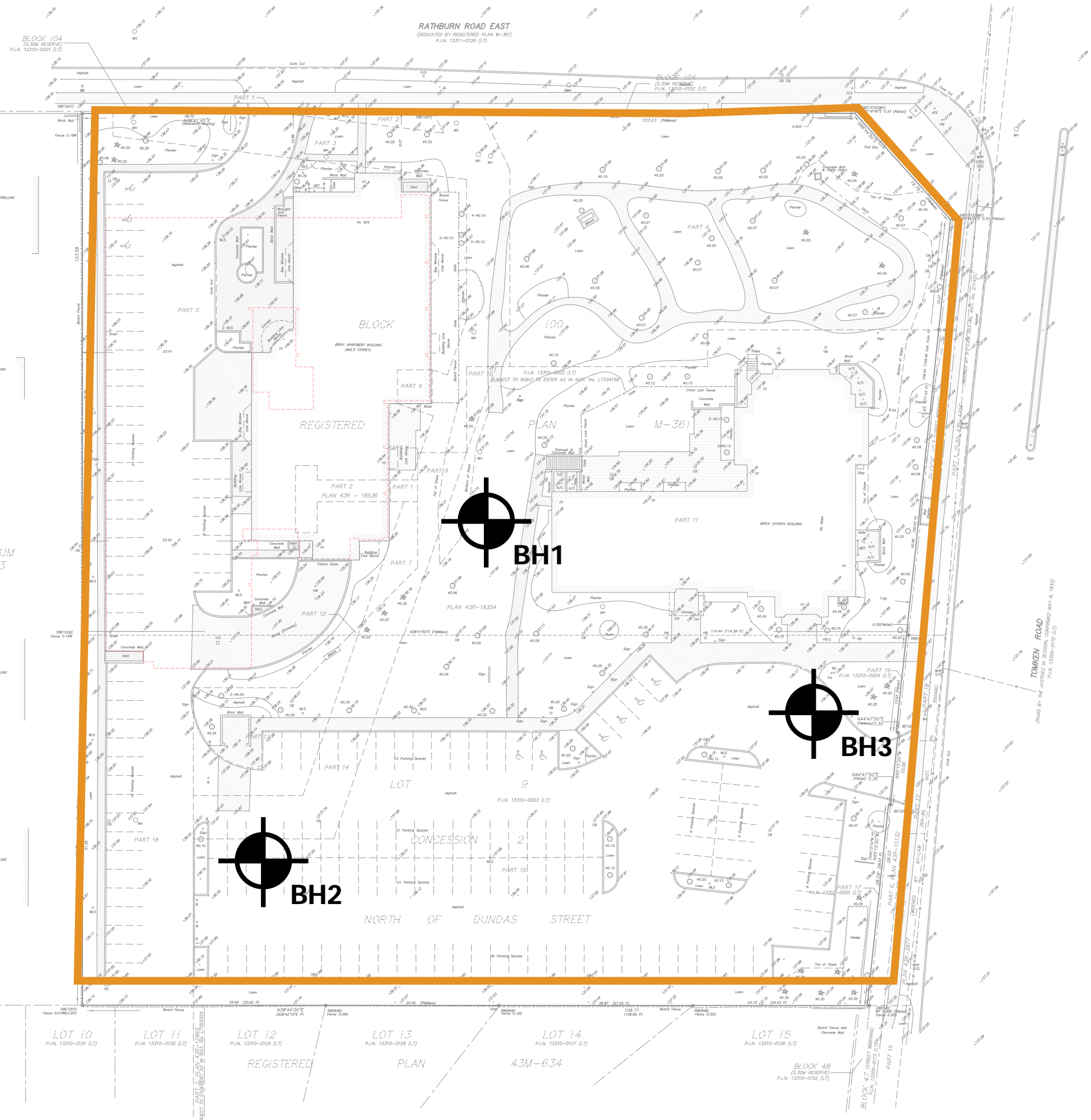
Job No

22-087

Figure No

FIGURE 1





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

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- ⊕ MONITORING WELL/BOREHOLE BY GROUNDED

Note

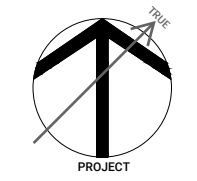
Reference
 Survey Drawing job no. 201-0277.
 Dated: Dec. 3, 2021.
 Prepared by Speight, Van Nortrand & Gibson Limited.
 Received on June 06, 2022.

Project

**4094 Tomken Rd.,
 Mississauga, ON,
 L4W 1J5**

Figure Title
**BOREHOLE LOCATION
 PLAN - EXISTING
 CONDITIONS**

North



Date

AUGUST 2022

Scale

AS INDICATED

Job No

22-087

Figure No

FIGURE 2



GROUND
ENGINEERING

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

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- ⊕ MONITORING WELL/BOREHOLE BY GROUNDED

Note

Reference

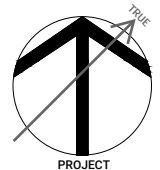
Site Plan Project no. 2112., Drawing no. A1-04, Mar 14, 2022, Prepared by KPMB Architects.

Project

**4094 Tomken Rd.,
Mississauga, ON,
L4W 1J5**

Figure Title
**BOREHOLE LOCATION
PLAN - PROPOSED
CONDITIONS**

North



Date

AUGUST 2022

Scale

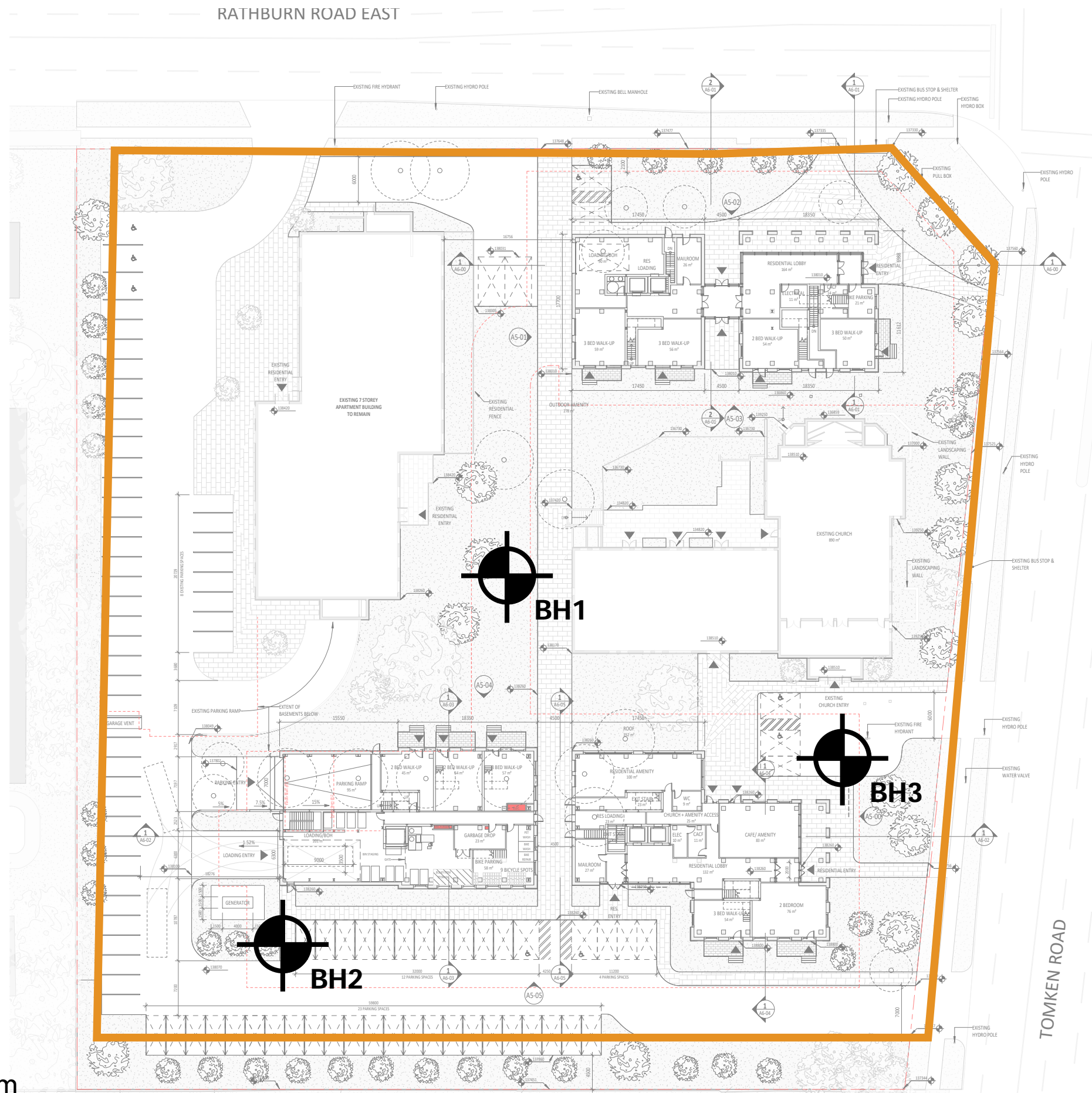
AS INDICATED

Job No

22-087

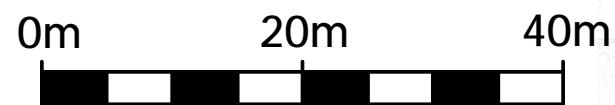
Figure No

FIGURE 3



RATHBURN ROAD EAST

TOMKEN ROAD



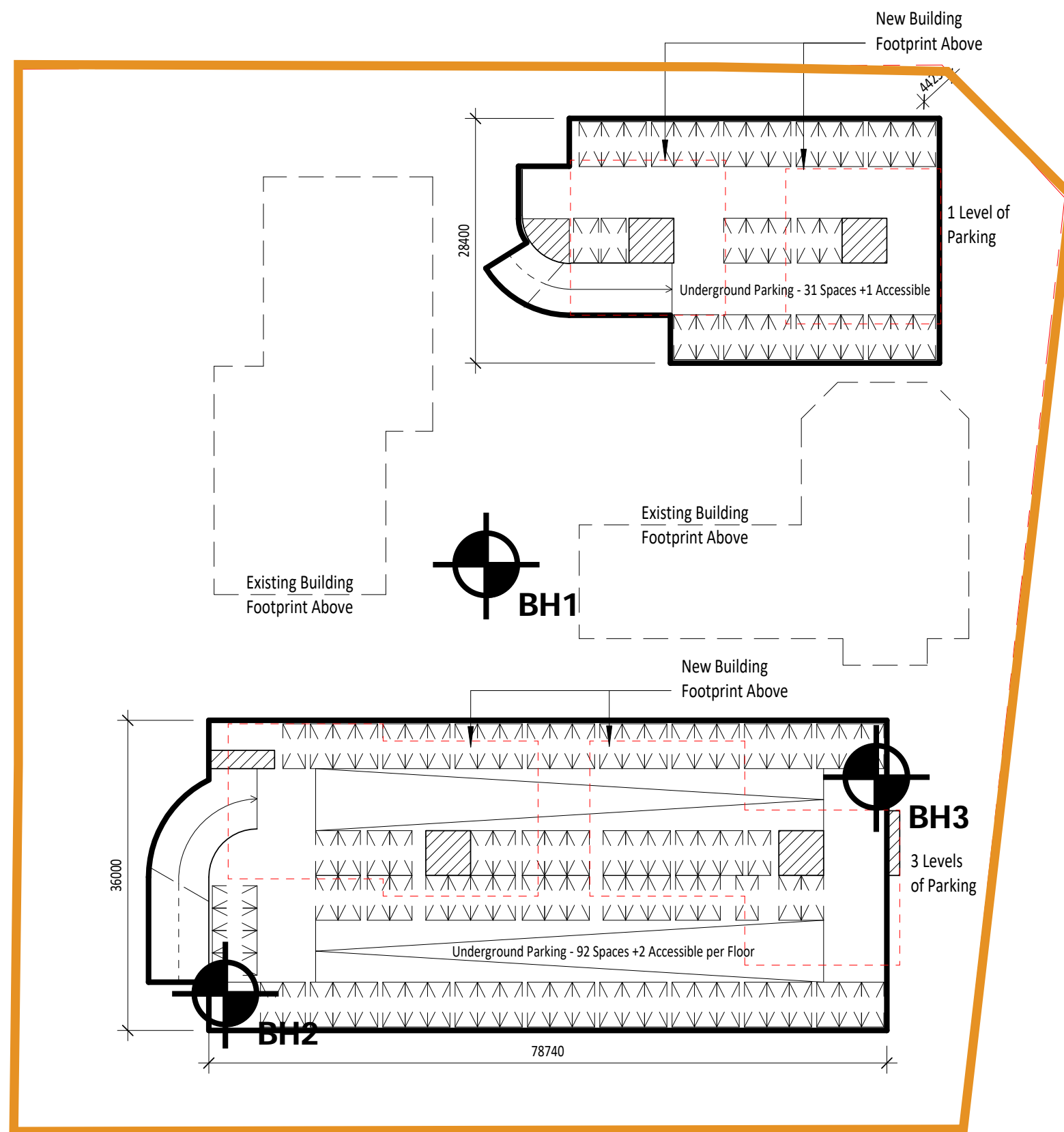


GROUND
ENGINEERING

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

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- ⊕ MONITORING WELL/BOREHOLE BY GROUNDED



Note

Reference

Westminster UC Concept Site Plan Project no. 2112., July, 2021, Prepared by KPMB Architects.

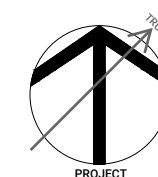
Project

**4094 Tomken Rd.,
Mississauga, ON,
L4W 1J5**

Figure Title

**PROPOSED
UNDERGROUND
PARKING STRUCTURES**

North



Date

AUGUST 2022

Scale

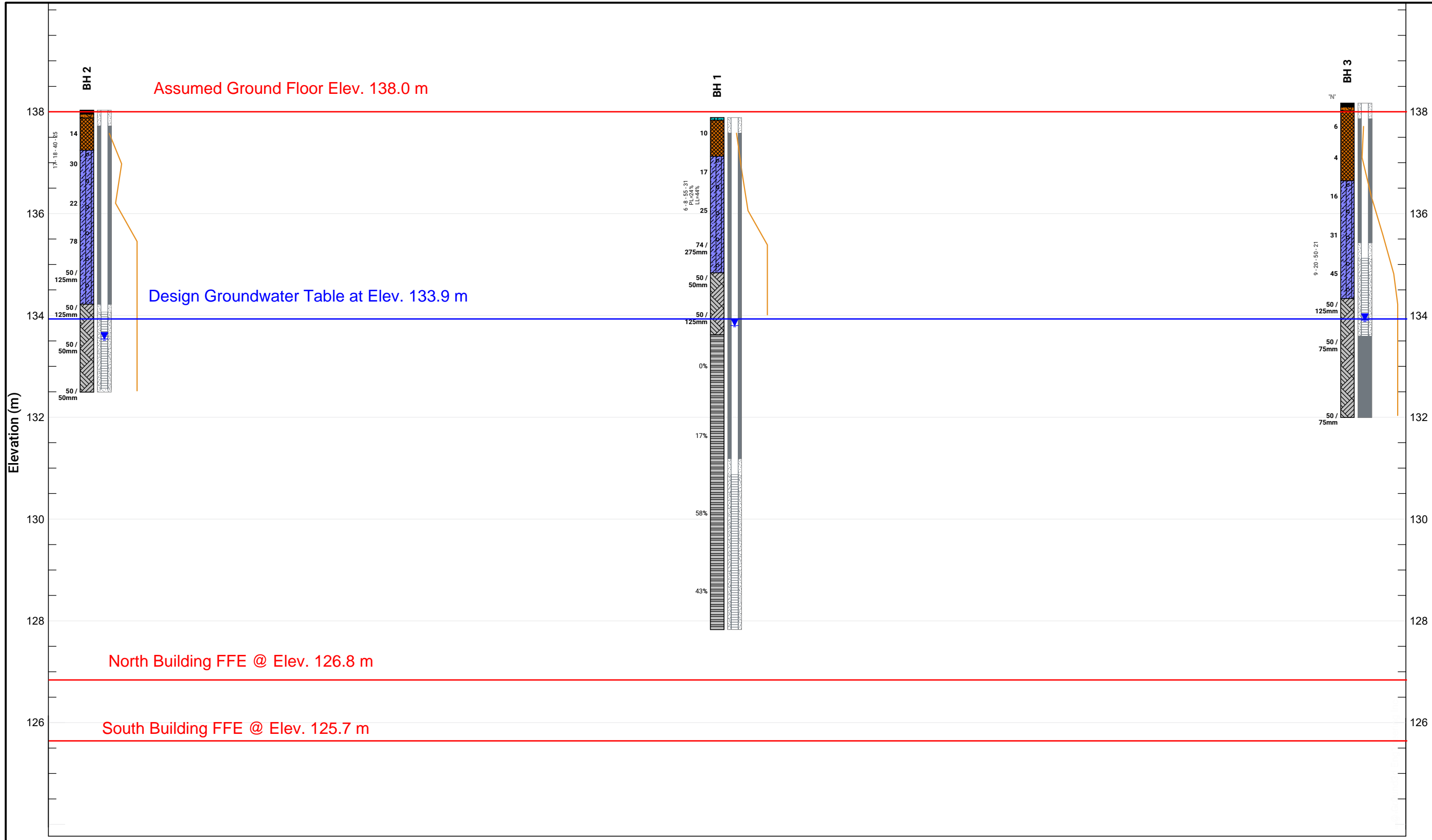
1:600

Job No

22-087




Figure No

FIGURE 4



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
**UPRC - WESTMINSTER -
4094 TOMKEN RD.
MISSISSAUGA, ON**

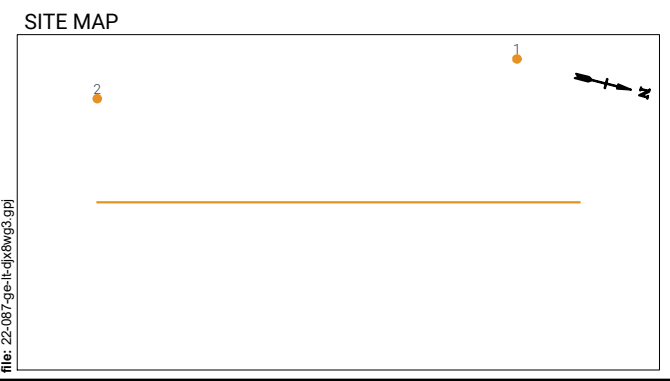
Figure Title
SUBSURFACE PROFILE

Date
AUGUST 2022





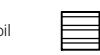

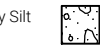
Scale
AS INDICATED

Job No
22-087

Figure No
FIGURE 5



LITHOLOGY GRAPHIC LEGEND

-  Topsoil
-  Bedrock (cored)
-  Fill
-  Asphalt
-  Clayey Silt Till
-  Aggregate
-  Bedrock (inferred)

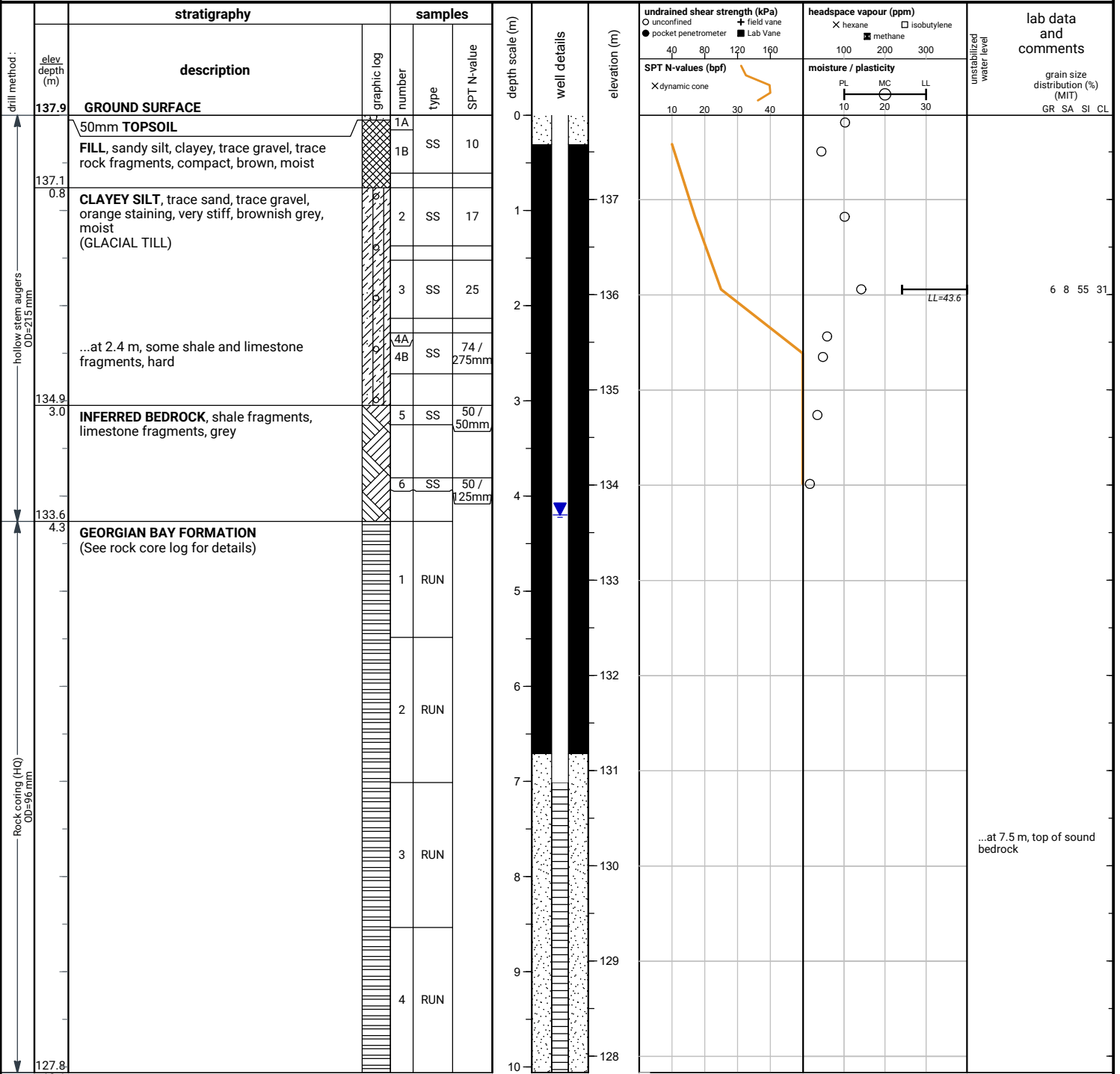
APPENDIX A



File No. : 22-087

Project : UPRC - Westminster - 4094 Tomken Rd., Mississauga, ON

Client : UPRC



END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

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

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 27, 2022	4.1	133.8
Jul 29, 2022	4.2	133.7

File No. : 22-087

Project : UPRC - Westminster - 4094 Tomken Rd., Mississauga, ON

Client : UPRC

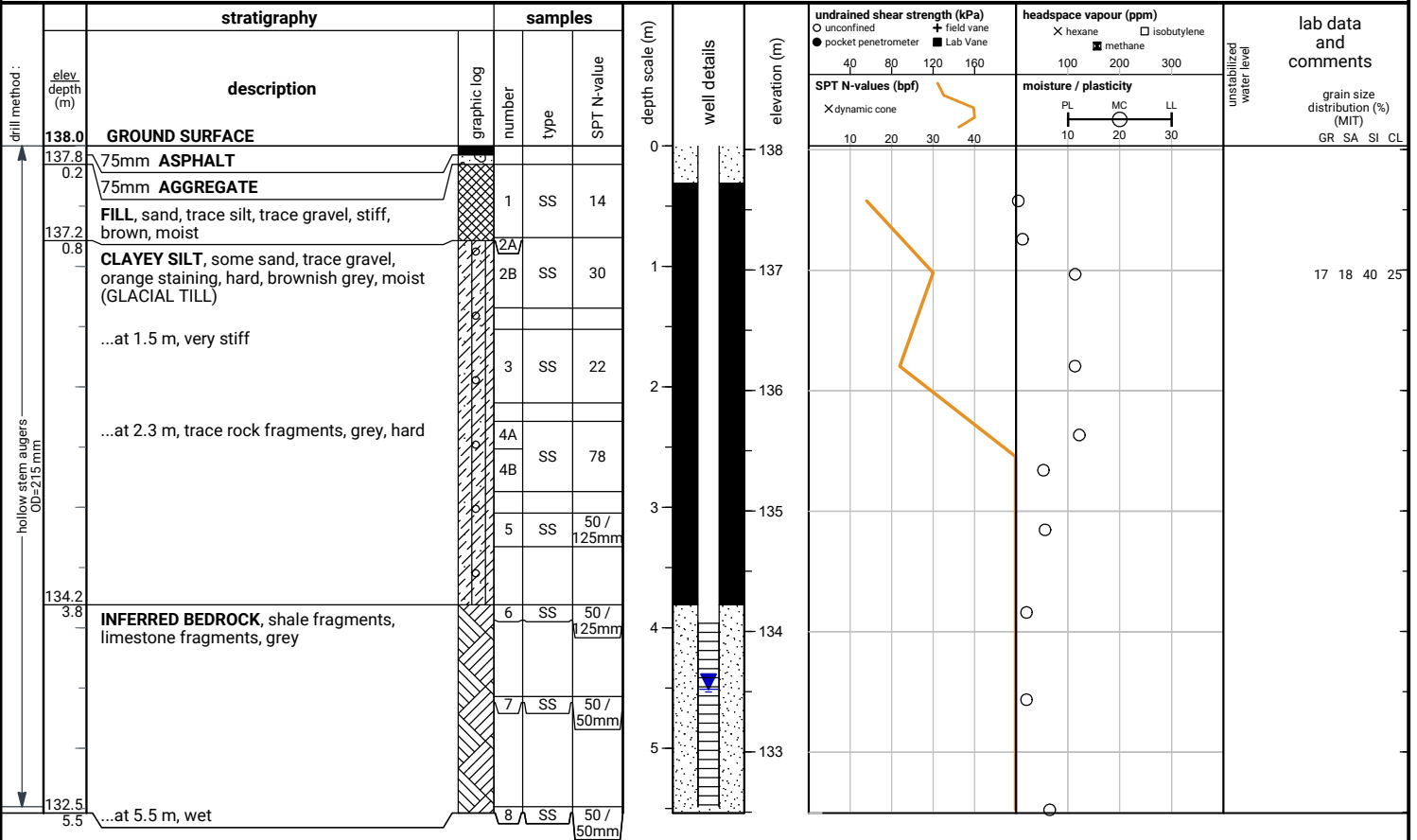
depth (m)	graphic log	stratigraphy	run elev depth (m)	recovery	elevation (m)	shale weathering zones						natural fracture frequency	laboratory testing	notes and comments	elevation (m)
						Z1	Z2	Z3	Z4	R1	R2				
		Rock coring started at 4.3m below grade	133.6												
		GEORGIAN BAY FORMATION Shale, grey, very thinly bedded to medium bedded, weak; joints are horizontal, closed, clean, smooth, planar; interbedded with limestone , light grey, laminated to thinly bedded, medium strong, occasionally fossiliferous Overall shale: 90%, limestone: 10% Run 1 : 4% limestone 96% shale	4.3	R1 TCR = 88% SCR = 56% RQD = 0%	133										4.3 / 133.6 - 4.6 / 133.3m: Rubblized Zone 4.7 / 133.2m: JT T CN
5			132.4	R2 TCR = 97% SCR = 63% RQD = 17%	132										5.6 / 132.3m: IS clay 5.6 / 132.3m: JT T CN 5.8 / 132.1m: Rubblized Zone 5.9 / 132.0m: IS clay 6.2 / 131.6m: IS clay
6			130.9	R3 TCR = 83% SCR = 67% RQD = 58%	131										6.5 / 131.4m: JT T CN 6.7 / 131.2m: JT T CN
7		... at 7.5 m (Elev. 130.4 m), transition to sound rock	7.0		130										7.0 / 130.9 - 7.3 / 130.6m: No recovery, washed out
8			129.4	R4 TCR = 103% SCR = 98% RQD = 43%	129										8.5 / 129.4m: IS clay
9			127.8		128										9.0 / 128.9m: Rubblized Zone
10			10.1m												

END OF COREHOLE

File No. : 22-087

Project : UPRC - Westminster - 4094 Tomken Rd., Mississauga, ON

Client : UPRC



END OF BOREHOLE

Borehole was dry upon completion of drilling.

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

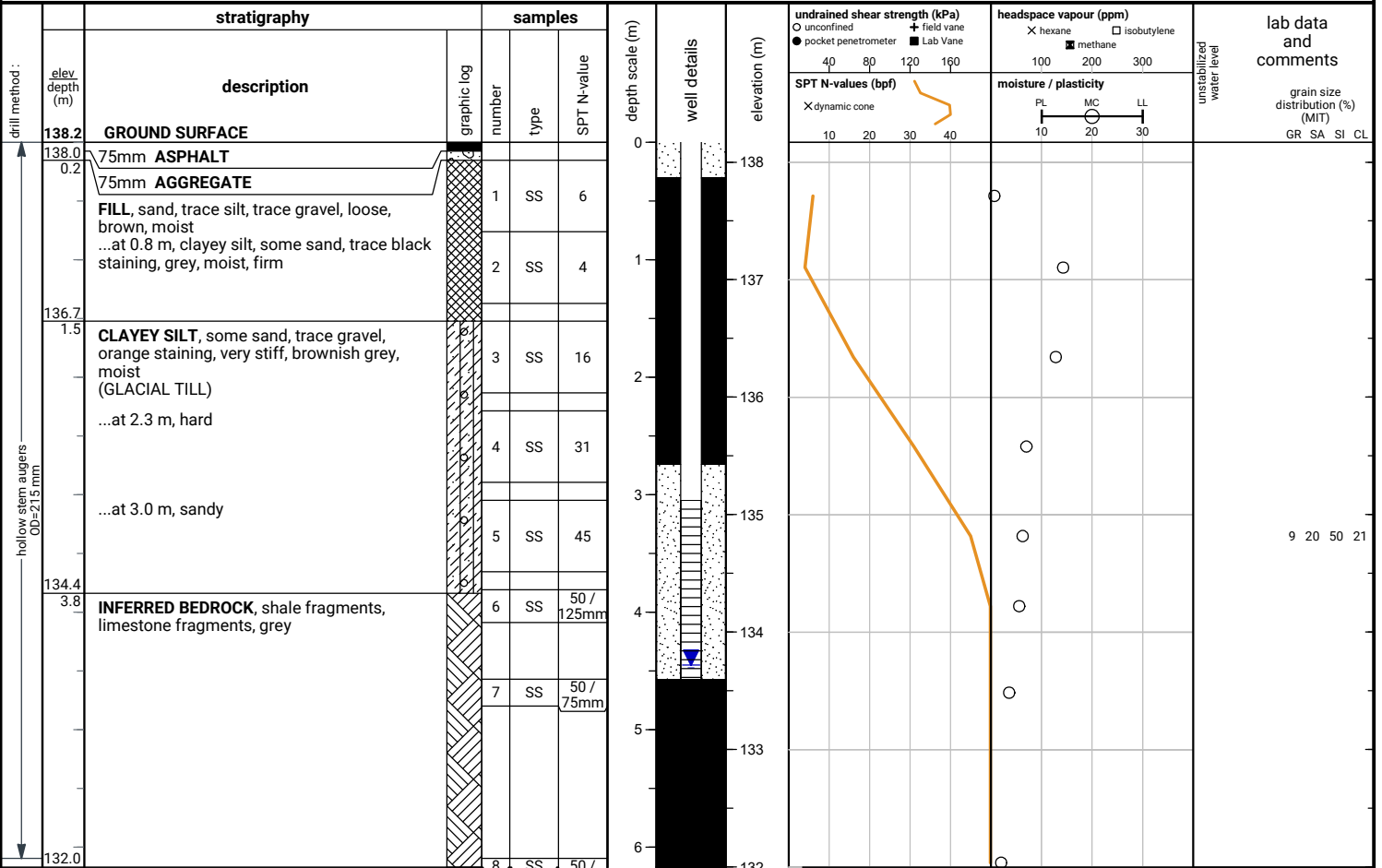
GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 14, 2022	4.1	133.9
Jun 27, 2022	4.5	133.5
Jul 29, 2022	4.5	133.5

File No. : 22-087

Project : UPRC - Westminster - 4094 Tomken Rd., Mississauga, ON

Client : UPRC



END OF BOREHOLE

Borehole was dry upon completion of drilling.

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

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 14, 2022	dry	n/a
Jun 27, 2022	4.3	133.9
Jul 29, 2022	4.5	133.7

APPENDIX B





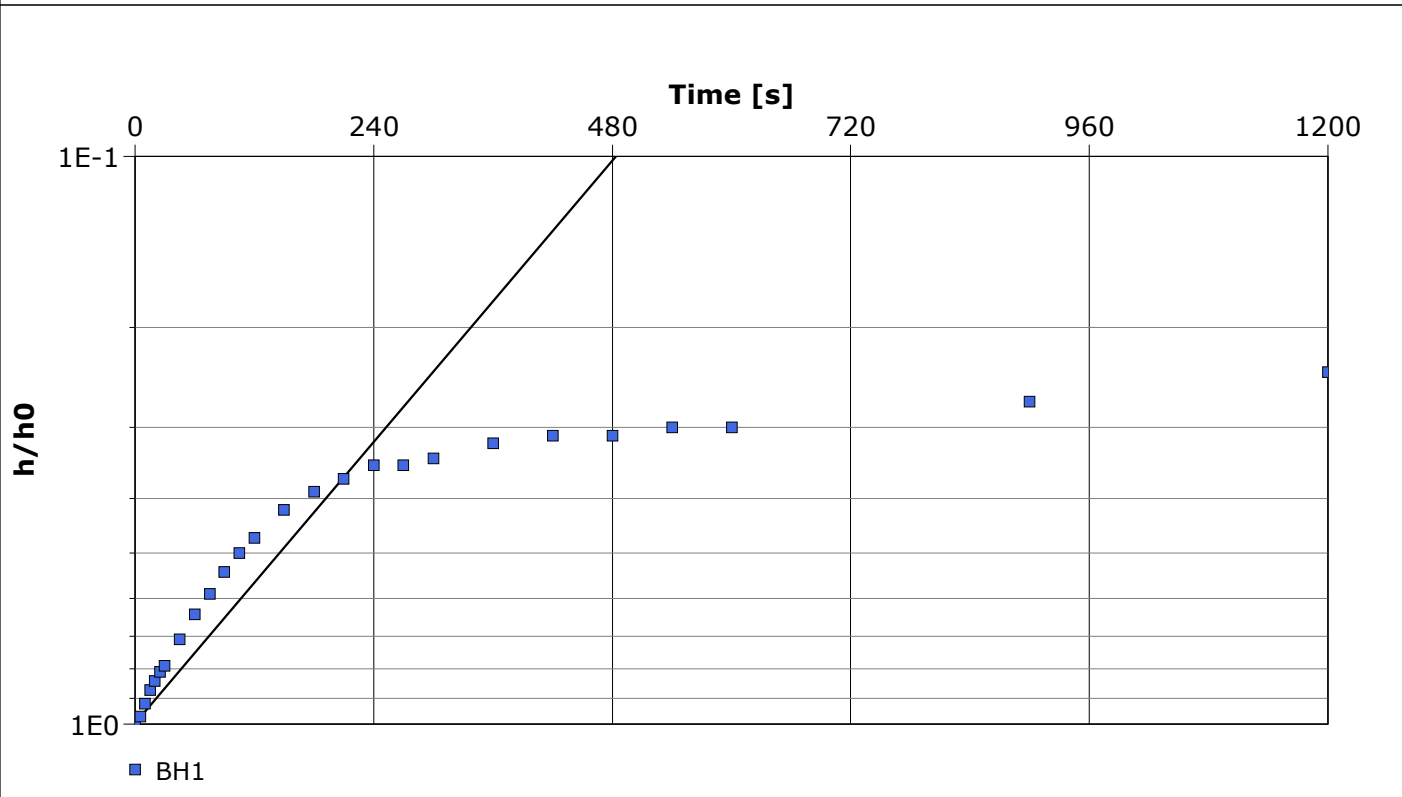
Slug Test Analysis Report

Project: UPRC - Westminster - 4094 Tomken Road

Number: 22-087

Client: UPRC

Location: 4094 Tomken Road, Mississauga	Slug Test: BH1 RHT	Test Well: BH1
Test Conducted by: DI		Test Date: 2022-06-27
Analysis Performed by: NP	BH1 RHT	Analysis Date: 2022-07-27
Aquifer Thickness: 14.00 m		



Calculation using Bouwer & Rice		
Observation Well	Hydraulic Conductivity [m/s]	
BH1	1.03×10^{-6}	



Slug Test Analysis Report

Project: UPRC - Westminster - 4094 Tomken Road

Number: 22-087

Client: UPRC

Location: 4094 Tomken Road, Mississauga | Slug Test: BH2 RHT

Test Well: BH2

Test Conducted by: DI

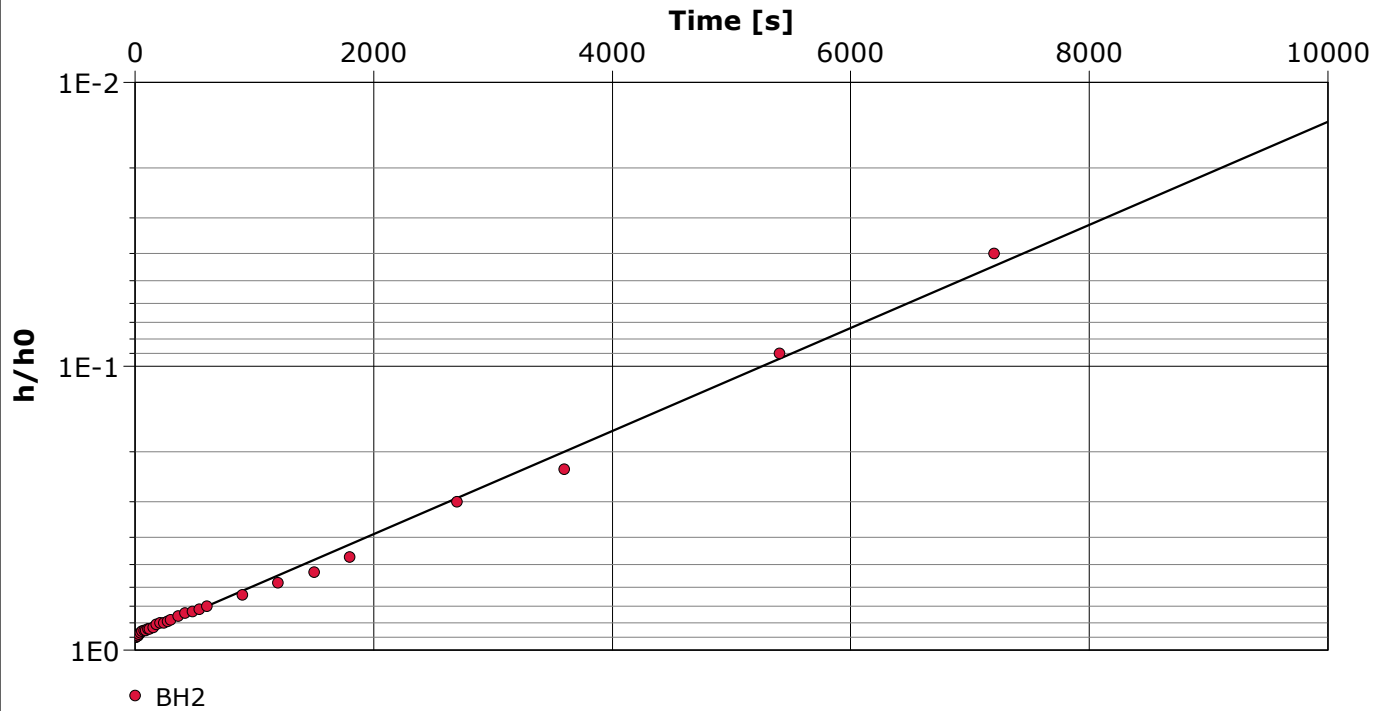
Test Date: 2022-06-27

Analysis Performed by: NP

BH2 RHT

Analysis Date: 2022-07-27

Aquifer Thickness: 6.00 m

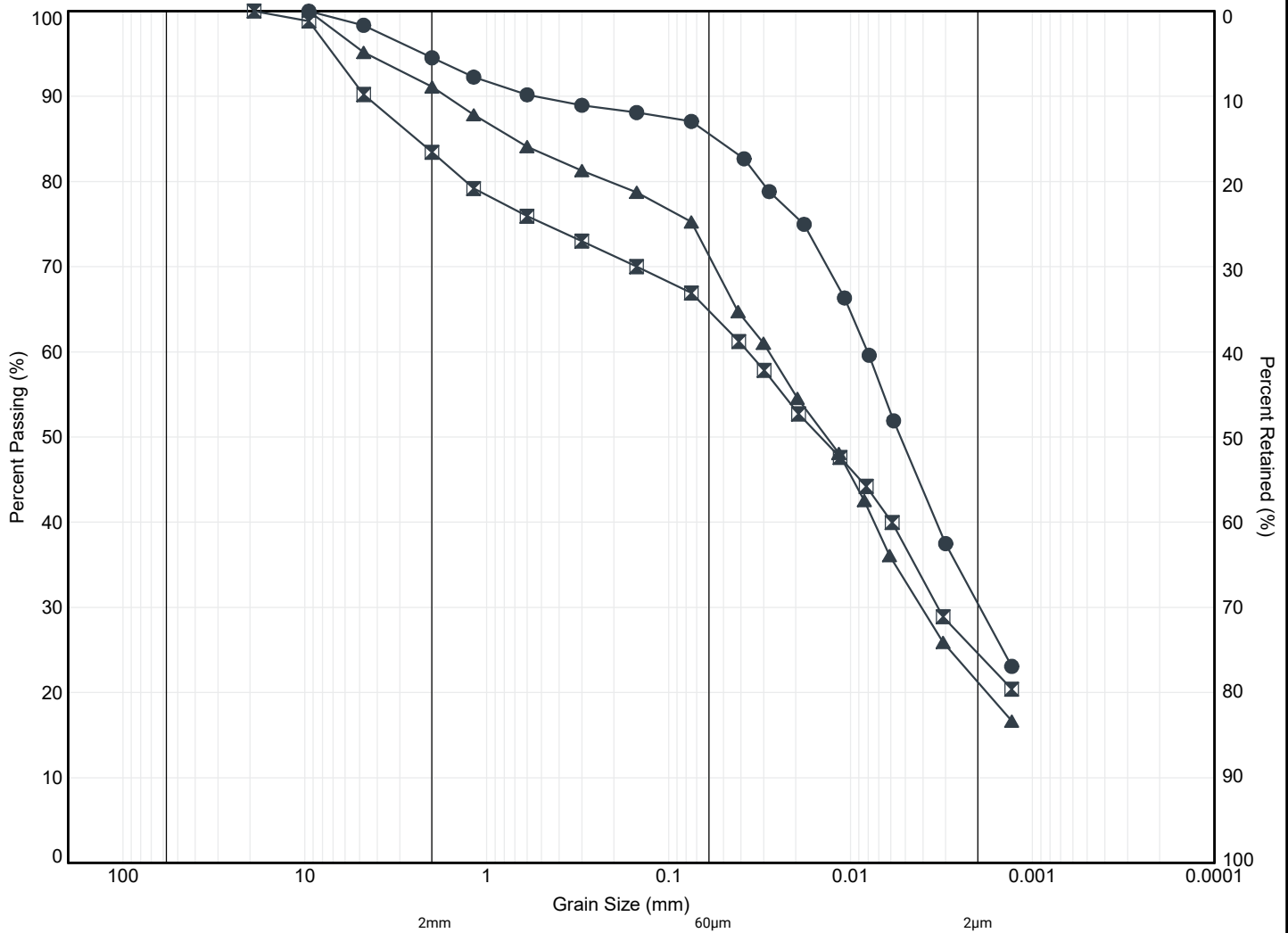


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]
BH2	4.43×10^{-7}

APPENDIX C





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

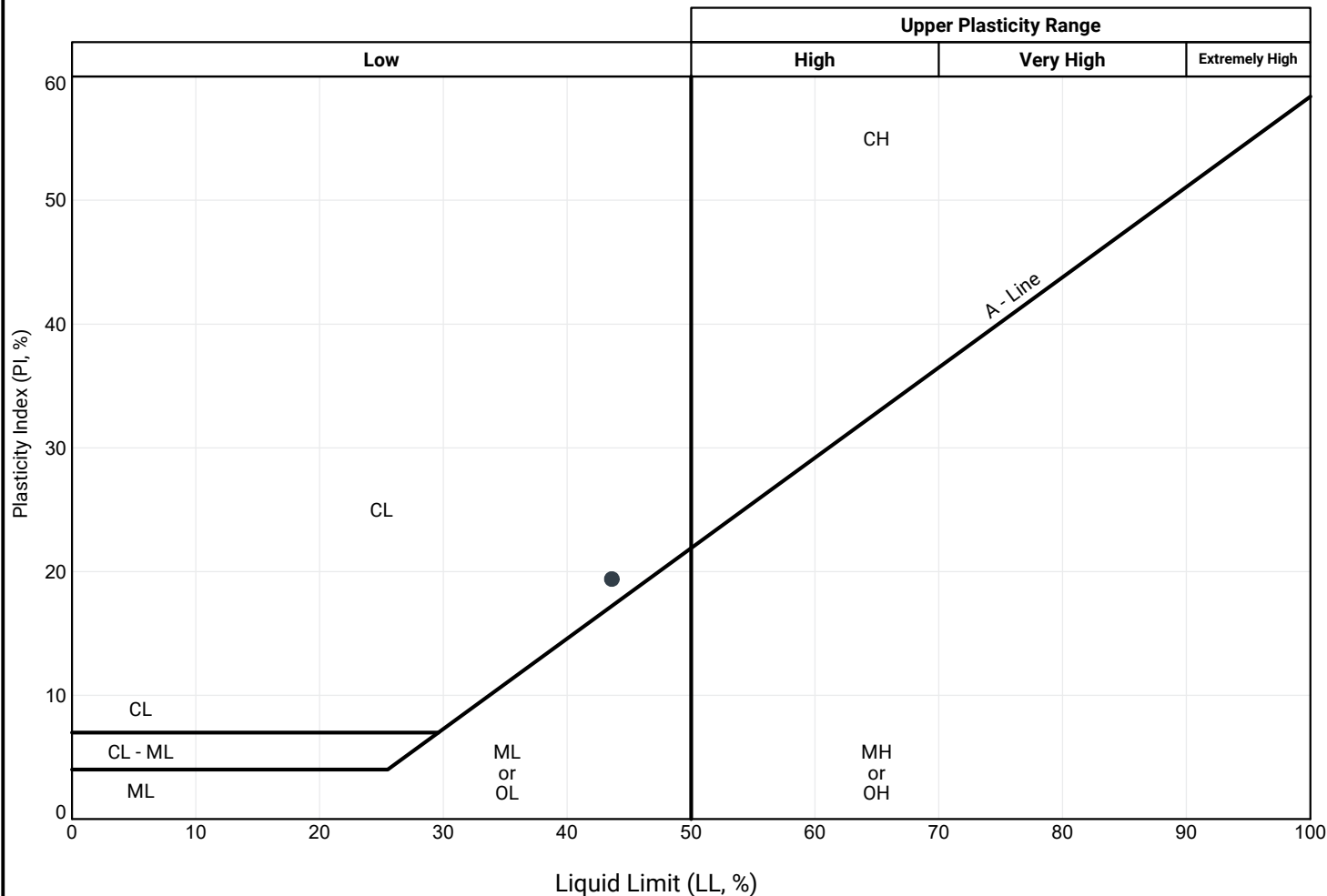
MIT SYSTEM

	Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
●	1	SS3	1.8	136.1	6	8	55	31
⊠	2	2B	1.1	137.0	17	18	40	25
▲	3	SS5	3.4	134.8	9	20	50	21



Title: **GRAIN SIZE DISTRIBUTION**

File No.: **22-087**



Borehole	Sample	Depth (m)	Elev. (m)	LL (%)	PL (%)	PI (%)
● 1	SS3	1.8	136.1	44	24	20

APPENDIX D





K from Grain Size Analysis Report

Date: 22-Jun-21

Sample Name:

BH1 SS3

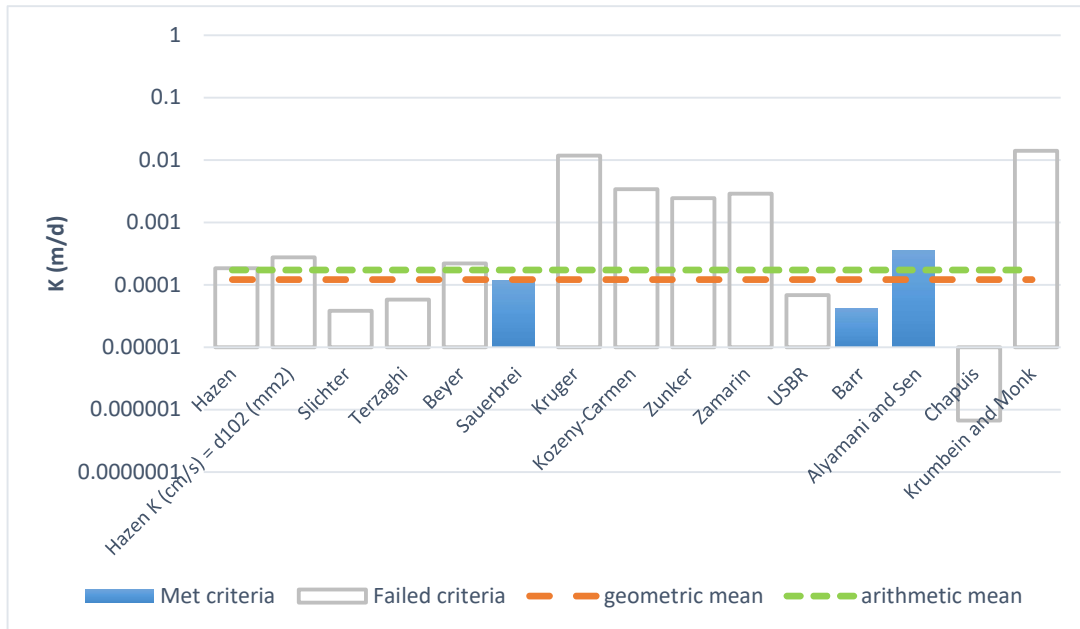
Mass Sample (g):

289.8

T (oC)

20

Poorly sorted clay with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	2.1E-07	2.1E-09	0.00	
Hazen K (cm/s) = d ₁₀ (mm)	3.2E-07	3.2E-09	0.00	
Slichter	4.4E-08	4.4E-10	0.00	
Terzaghi	6.7E-08	6.7E-10	0.00	
Beyer	2.5E-07	2.5E-09	0.00	
Sauerbrei	1.4E-07	1.4E-09	0.00	
Kruger	1.4E-05	1.4E-07	0.01	
Kozeny-Carmen	3.9E-06	3.9E-08	0.00	
Zunker	2.8E-06	2.8E-08	0.00	
Zamarin	3.4E-06	3.4E-08	0.00	
USBR	7.9E-08	7.9E-10	0.00	
Barr	4.9E-08	4.9E-10	0.00	
Alyamani and Sen	4.1E-07	4.1E-09	0.00	
Chapuis	7.7E-10	7.7E-12	0.00	
Krumbein and Monk	1.6E-05	1.6E-07	0.01	
geometric mean	1.4E-07	1.4E-09	0.00	
arithmetic mean	2.0E-07	2.0E-09	0.00	



K from Grain Size Analysis Report

Date: 22-Jun-22

Sample Name:

BH2 SS2B

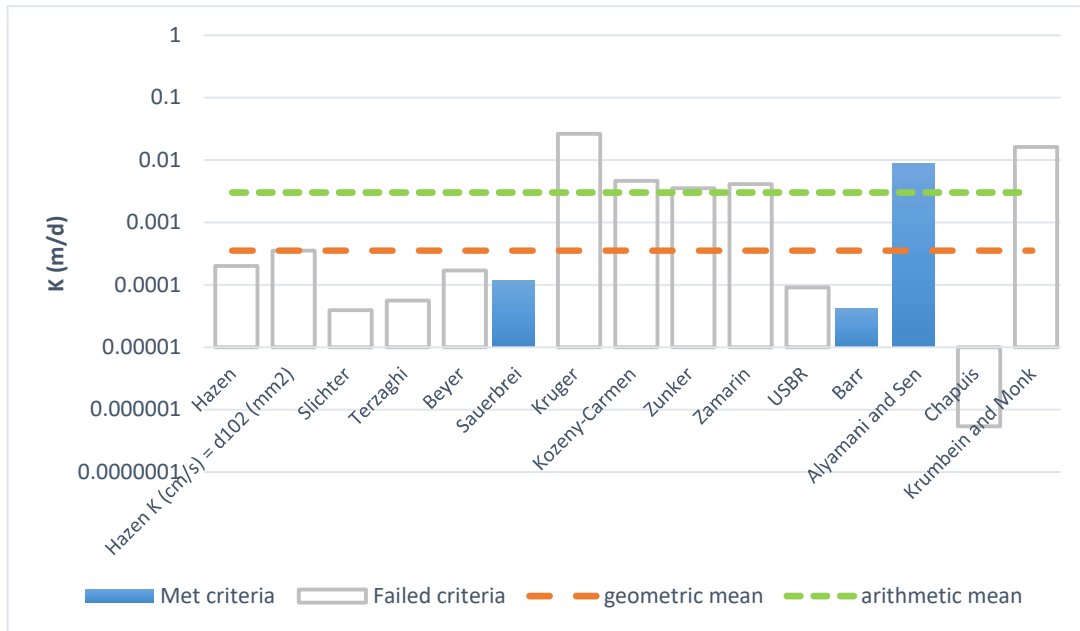
Mass Sample (g):

189.6

T (oC)

20

Poorly sorted clay 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	6.5E-08	6.5E-10	0.00	
Beyer	2.0E-07	2.0E-09	0.00	
Sauerbrei	1.4E-07	1.4E-09	0.00	
Kruger	3.0E-05	3.0E-07	0.03	
Kozeny-Carmen	5.4E-06	5.4E-08	0.00	
Zunker	4.1E-06	4.1E-08	0.00	
Zamarin	4.8E-06	4.8E-08	0.00	
USBR	1.1E-07	1.1E-09	0.00	
Barr	4.9E-08	4.9E-10	0.00	
Alyamani and Sen	1.0E-05	1.0E-07	0.01	
Chapuis	6.2E-10	6.2E-12	0.00	
Krumbein and Monk	1.9E-05	1.9E-07	0.02	
geometric mean	4.1E-07	4.1E-09	0.00	
arithmetic mean	3.5E-06	3.5E-08	0.00	



K from Grain Size Analysis Report

Date: 22-Jun-22

Sample Name:

BH3 SS5

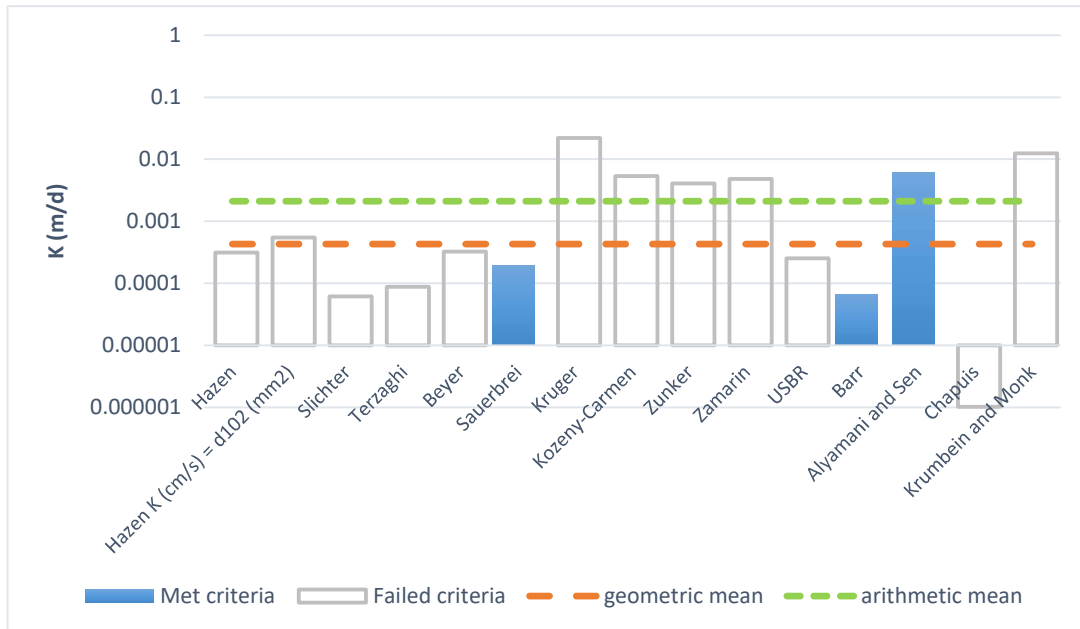
Mass Sample (g):

126

T (oC)

20

Poorly sorted clay with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	3.6E-07	3.6E-09	0.00	
Hazen K (cm/s) = d ₁₀ (mm)	6.3E-07	6.3E-09	0.00	
Slichter	7.1E-08	7.1E-10	0.00	
Terzaghi	1.0E-07	1.0E-09	0.00	
Beyer	3.8E-07	3.8E-09	0.00	
Sauerbrei	2.3E-07	2.3E-09	0.00	
Kruger	2.6E-05	2.6E-07	0.02	
Kozeny-Carmen	6.2E-06	6.2E-08	0.01	
Zunker	4.7E-06	4.7E-08	0.00	
Zamarin	5.6E-06	5.6E-08	0.00	
USBR	2.9E-07	2.9E-09	0.00	
Barr	7.6E-08	7.6E-10	0.00	
Alyamani and Sen	7.1E-06	7.1E-08	0.01	
Chapuis	1.2E-09	1.2E-11	0.00	
Krumbein and Monk	1.4E-05	1.4E-07	0.01	
geometric mean	5.0E-07	5.0E-09	0.00	
arithmetic mean	2.5E-06	2.5E-08	0.00	

APPENDIX E





CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order : WT2205574

Amendment : 2

Client : Grounded Engineering Inc.

Contact : Emma Leet

Address : 1 Banigan Drive
Toronto ON Canada M4H 1G3

Telephone : 647 264 7932

Project : 22-087

PO : ---

C-O-C number : 20-951655

Sampler : AJ

Site : 4094 TOMKEN RO, MISSISSAUGA

Quote number : Q88323 - SOA

No. of samples received : 1

No. of samples analysed : 1

Page : 1 of 11

Laboratory : Waterloo - Environmental

Account Manager : Amanda Overholster

Address : 60 Northland Road, Unit 1
Waterloo, Ontario Canada N2V 2B8

Telephone : 1 416 817 2944

Date Samples Received : 14-Jun-2022 17:00

Date Analysis Commenced : 15-Jun-2022

Issue Date : 25-Aug-2022 16:54

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

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

Signatories

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

Signatories	Position	Laboratory Department
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Microbiology, Waterloo, Ontario
Andrea Armstrong	Department Manager - Air Quality and Volatiles	Organics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Jeremy Gingras	Team Leader - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Jihun Jeon	Laboratory Analyst	LCMS, Waterloo, Ontario
Jocelyn Kennedy	Department Manager - Semi-Volatile Organics	Organics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Metals, Waterloo, Ontario



General Comments

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

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

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

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

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

<i>Unit</i>	<i>Description</i>
µg/L	micrograms per litre
CFU/100mL	colony forming units per 100 mL
mg/L	milligrams per litre
pH units	pH units

>: greater than.

<: less than.

Red shading is applied where the result is greater than the Guideline Upper Limit or the result is lower than the Guideline Lower Limit.

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

Workorder Comments

Amendment (25/AUG/2022): This report has been amended and re-released to allow additional pertinent comments to be added to the report. All analysis results are as per the previous report. Adding Mississauga Storm/Peel San criteria per client request.

Amendment (23/AUG/2022): This report has been amended following minor LIMS report formatting corrections. All analysis results are as per the previous report.

RRQC: BOD Duplicate within low level acceptance criteria



Qualifiers

<i>Qualifier</i>	<i>Description</i>
<i>BODL</i>	<i>Limit of Reporting for BOD was increased to account for the largest volume of sample tested.</i>
<i>DLDS</i>	<i>Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.</i>
<i>DLHC</i>	<i>Detection Limit Raised: Dilution required due to high concentration of test analyte(s).</i>
<i>DLUI</i>	<i>Detection Limit Raised: Unknown interference generated an apparent false positive test result.</i>



Analytical Results Evaluation

Matrix: Groundwater		Client sample ID	SW-UF-BH2	---	---	---	---	---	---
		Sampling date/time	14-Jun-2022 15:00	---	---	---	---	---	---
		Sub-Matrix	Groundwater	---	---	---	---	---	---
Analyte	CAS Number	Unit	WT2205574-001	-----	-----	-----	-----	-----	-----
Physical Tests									
pH	---	pH units	7.77	---	---	---	---	---	---
solids, total suspended [TSS]	---	mg/L	177	---	---	---	---	---	---
Anions and Nutrients									
fluoride	16984-48-8	mg/L	0.360 ^{DLDS}	---	---	---	---	---	---
Kjeldahl nitrogen, total [TKN]	---	mg/L	4.90	---	---	---	---	---	---
phosphorus, total	7723-14-0	mg/L	0.127	---	---	---	---	---	---
sulfate (as SO4)	14808-79-8	mg/L	85.6 ^{DLDS}	---	---	---	---	---	---
Cyanides									
cyanide, strong acid dissociable (total)	---	mg/L	0.0037	---	---	---	---	---	---
Microbiological Tests									
coliforms, Escherichia coli [E. coli]	---	CFU/100mL	Not Detected	---	---	---	---	---	---
Total Metals									
aluminum, total	7429-90-5	mg/L	4.18	---	---	---	---	---	---
antimony, total	7440-36-0	mg/L	<0.00100 ^{DLHC}	---	---	---	---	---	---
arsenic, total	7440-38-2	mg/L	0.00430 ^{DLHC}	---	---	---	---	---	---
cadmium, total	7440-43-9	mg/L	0.0000641 ^{DLHC}	---	---	---	---	---	---
chromium, total	7440-47-3	mg/L	0.00704 ^{DLHC}	---	---	---	---	---	---
cobalt, total	7440-48-4	mg/L	0.00993 ^{DLHC}	---	---	---	---	---	---
copper, total	7440-50-8	mg/L	<0.00500 ^{DLHC}	---	---	---	---	---	---
lead, total	7439-92-1	mg/L	0.00195 ^{DLHC}	---	---	---	---	---	---
manganese, total	7439-96-5	mg/L	0.695 ^{DLHC}	---	---	---	---	---	---
mercury, total	7439-97-6	mg/L	<0.0000050	---	---	---	---	---	---
molybdenum, total	7439-98-7	mg/L	0.00988 ^{DLHC}	---	---	---	---	---	---
nickel, total	7440-02-0	mg/L	0.00922 ^{DLHC}	---	---	---	---	---	---
selenium, total	7782-49-2	mg/L	<0.000500 ^{DLHC}	---	---	---	---	---	---
silver, total	7440-22-4	mg/L	<0.000100 ^{DLHC}	---	---	---	---	---	---
tin, total	7440-31-5	mg/L	0.00223 ^{DLHC}	---	---	---	---	---	---



Analytical Results Evaluation

Matrix: Groundwater			Client sample ID	SW-UF-BH2	----	----	----	----	----	----
			Sampling date/time	14-Jun-2022 15:00	----	----	----	----	----	----
			Sub-Matrix	Groundwater	----	----	----	----	----	----
Analyte	CAS Number	Unit	WT2205574-001	-----	-----	-----	-----	-----	-----	-----
Phthalate Esters										
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	µg/L	<2.0	----	----	----	----	----	----	----
di-n-butyl phthalate	84-74-2	µg/L	<1.0	----	----	----	----	----	----	----
Semi-Volatile Organics Surrogates										
fluorobiphenyl, 2-terphenyl-d14, p-	321-60-8	%	87.7	----	----	----	----	----	----	----
	1718-51-0	%	86.5	----	----	----	----	----	----	----
Phenolics Surrogates										
tribromophenol, 2,4,6-	118-79-6	%	110	----	----	----	----	----	----	----
Nonylphenols										
nonylphenol diethoxylates [NP2EO]	n/a	µg/L	<0.10	----	----	----	----	----	----	----
nonylphenol ethoxylates, total	n/a	µg/L	<2.0	----	----	----	----	----	----	----
nonylphenol monoethoxylates [NP1EO]	n/a	µg/L	<2.0	----	----	----	----	----	----	----
nonylphenols [NP]	84852-15-3	µg/L	77.9 ^{DLHC}	----	----	----	----	----	----	----
Polychlorinated Biphenyls										
Aroclor 1016	12674-11-2	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1221	11104-28-2	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1232	11141-16-5	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1242	53469-21-9	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1248	12672-29-6	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1254	11097-69-1	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1260	11096-82-5	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1262	37324-23-5	µg/L	<0.020	----	----	----	----	----	----	----
Aroclor 1268	11100-14-4	µg/L	<0.020	----	----	----	----	----	----	----
polychlorinated biphenyls [PCBs], total	----	µg/L	<0.060	----	----	----	----	----	----	----
Polychlorinated Biphenyls Surrogates										
decachlorobiphenyl	2051-24-3	%	74.6	----	----	----	----	----	----	----
tetrachloro-m-xylene	877-09-8	%	107	----	----	----	----	----	----	----

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



Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
SW-UF-BH2	Water	solids, total suspended [TSS]		MISSUB	STM	177 mg/L	15 mg/L
	Water	Kjeldahl nitrogen, total [TKN]		MISSUB	STM	4.90 mg/L	1 mg/L
	Water	aluminum, total		MISSUB	STM	4.18 mg/L	1 mg/L
	Water	manganese, total		MISSUB	STM	0.695 mg/L	0.05 mg/L
	Water	nonylphenols [NP]		RMPSUB	SAN	77.9 µg/L	20 µg/L



Summary of Guideline Limits

Analyte	CAS Number	Unit	MISSUB STM	RMPSUB SAN					
Physical Tests									
pH	----	pH units	6 - 9 pH units	5.5 - 10 pH units					
solids, total suspended [TSS]	----	mg/L	15 mg/L	350 mg/L					
Anions and Nutrients									
fluoride	16984-48-8	mg/L		10 mg/L					
Kjeldahl nitrogen, total [TKN]	----	mg/L	1 mg/L	100 mg/L					
phosphorus, total	7723-14-0	mg/L	0.4 mg/L	10 mg/L					
sulfate (as SO4)	14808-79-8	mg/L							
Cyanides									
cyanide, strong acid dissociable (total)	----	mg/L	0.02 mg/L	2 mg/L					
Microbiological Tests									
coliforms, Escherichia coli [E. coli]	----	CFU/100mL	200 CFU/100mL						
Total Metals									
aluminum, total	7429-90-5	mg/L	1 mg/L	50 mg/L					
antimony, total	7440-36-0	mg/L		5 mg/L					
arsenic, total	7440-38-2	mg/L	0.02 mg/L	1 mg/L					
cadmium, total	7440-43-9	mg/L	0.008 mg/L	0.7 mg/L					
chromium, total	7440-47-3	mg/L	0.08 mg/L	5 mg/L					
cobalt, total	7440-48-4	mg/L		5 mg/L					
copper, total	7440-50-8	mg/L	0.04 mg/L	3 mg/L					
lead, total	7439-92-1	mg/L	0.12 mg/L	3 mg/L					
manganese, total	7439-96-5	mg/L	0.05 mg/L	5 mg/L					
mercury, total	7439-97-6	mg/L	0.0004 mg/L	0.01 mg/L					
molybdenum, total	7439-98-7	mg/L		5 mg/L					
nickel, total	7440-02-0	mg/L	0.08 mg/L	3 mg/L					
selenium, total	7782-49-2	mg/L	0.02 mg/L	1 mg/L					
silver, total	7440-22-4	mg/L	0.12 mg/L	5 mg/L					
tin, total	7440-31-5	mg/L		5 mg/L					
titanium, total	7440-32-6	mg/L		5 mg/L					
zinc, total	7440-66-6	mg/L	0.04 mg/L	3 mg/L					
Aggregate Organics									
carbonaceous biochemical oxygen demand [CBOD]	----	mg/L		300 mg/L					
oil & grease (gravimetric)	----	mg/L							
oil & grease, animal/vegetable (gravimetric)	----	mg/L		150 mg/L					
oil & grease, mineral (gravimetric)	----	mg/L		15 mg/L					
phenols, total (4AAP)	----	mg/L	0.008 mg/L	1 mg/L					



Analyte	CAS Number	Unit	MISSUB STM	RMPSUB SAN					
Volatile Organic Compounds									
benzene	71-43-2	µg/L	2 µg/L	10 µg/L					
chloroform	67-66-3	µg/L		40 µg/L					
dichlorobenzene, 1,2-	95-50-1	µg/L		50 µg/L					
dichlorobenzene, 1,4-	106-46-7	µg/L		80 µg/L					
dichloroethylene, cis-1,2-	156-59-2	µg/L		4000 µg/L					
dichloromethane	75-09-2	µg/L		2000 µg/L					
dichloropropylene, trans-1,3-	10061-02-6	µg/L		140 µg/L					
ethylbenzene	100-41-4	µg/L	2 µg/L	160 µg/L					
methyl ethyl ketone [MEK]	78-93-3	µg/L		8000 µg/L					
styrene	100-42-5	µg/L		200 µg/L					
tetrachloroethane, 1,1,2,2-	79-34-5	µg/L		1400 µg/L					
tetrachloroethylene	127-18-4	µg/L		1000 µg/L					
toluene	108-88-3	µg/L	2 µg/L	270 µg/L					
trichloroethylene	79-01-6	µg/L		400 µg/L					
xylene, m+p-	179601-23-1	µg/L							
xylene, o-	95-47-6	µg/L							
xylene, total	1330-20-7	µg/L	4.4 µg/L	1400 µg/L					
Phthalate Esters									
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	µg/L		12 µg/L					
di-n-butyl phthalate	84-74-2	µg/L		80 µg/L					
Nonylphenols									
nonylphenol diethoxylates [NP2EO]	n/a	µg/L							
nonylphenol ethoxylates, total	n/a	µg/L		200 µg/L					
nonylphenol monoethoxylates [NP1EO]	n/a	µg/L							
nonylphenols [NP]	84852-15-3	µg/L		20 µg/L					
Polychlorinated Biphenyls									
Aroclor 1016	12674-11-2	µg/L							
Aroclor 1221	11104-28-2	µg/L							
Aroclor 1232	11141-16-5	µg/L							
Aroclor 1242	53469-21-9	µg/L							
Aroclor 1248	12672-29-6	µg/L							
Aroclor 1254	11097-69-1	µg/L							
Aroclor 1260	11096-82-5	µg/L							
Aroclor 1262	37324-23-5	µg/L							
Aroclor 1268	11100-14-4	µg/L							
polychlorinated biphenyls [PCBs], total	----	µg/L		1 µg/L					

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



Key:

MISSUB	Ontario Mississauga Storm Sewer Use By-Law (0046-2022) (March 2022)
STM	Mississauga Storm Sewer (0046-2022)
RMPSUB	Ontario Reg. Mun. of Peel Sewer Bylaw #53-2010 (APR. 2011)
SAN	Reg. Mun. of Peel Sanitary by-law #53-2010

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: WT2205574	Page	: 1 of 11
Amendment	: 2		
Client	: Grounded Engineering Inc.	Laboratory	: Waterloo - Environmental
Contact	: Emma Leet	Account Manager	: Amanda Overholster
Address	: 1 Banigan Drive Toronto ON Canada M4H 1G3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 647 264 7932	Telephone	: 1 416 817 2944
Project	: 22-087	Date Samples Received	: 14-Jun-2022 17:00
PO	: ----	Issue Date	: 25-Aug-2022 16:54
C-O-C number	: 20-951655		
Sampler	: AJ		
Site	: 4094 TOMKEN RO, MISSISSAUGA		
Quote number	: Q88323 - SOA		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

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

Summary of Outliers

Outliers : Quality Control Samples

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

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Duplicate (DUP) RPDs								
Microbiological Tests	WT2205574-001	SW-UF-BH2	coliforms, Escherichia coli [E. coli]	----	E012A.EC	198 %	65%	Duplicate RPD does not meet the DQO for this test.
Aggregate Organics	WT2205574-001	SW-UF-BH2	carbonaceous biochemical oxygen demand [CBOD]	----	E555	37.0 % RRQC	30%	RPD exceeds DQO

Result Qualifiers

Qualifier	Description
RRQC	Refer to report comments for information regarding this QC result.

Laboratory Control Sample (LCS) Recoveries								
Aggregate Organics	QC-MRG2-5255110 02	----	oil & grease, mineral (gravimetric)	----	E567SG	66.2 % LCS-ND	70.0-130%	Recovery less than lower control limit

Result Qualifiers

Qualifier	Description
LCS-ND	Lab Control Sample recovery was slightly outside ALS DQO. Reported non-detect results for associated samples were unaffected.



Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Aggregate Organics : Biochemical Oxygen Demand (Carbonaceous) - 5 day											
HDPE [ON MECP] SW-UF-BH2	E555	14-Jun-2022	----	----	----		15-Jun-2022	4 days	0 days	✓	
Aggregate Organics : Mineral Oil & Grease by Gravimetry											
Amber glass total (hydrochloric acid) SW-UF-BH2	E567SG	14-Jun-2022	16-Jun-2022	28 days	2 days	✓	27-Jun-2022	40 days	11 days	✓	
Aggregate Organics : Oil & Grease by Gravimetry											
Amber glass total (hydrochloric acid) SW-UF-BH2	E567	14-Jun-2022	16-Jun-2022	28 days	2 days	✓	27-Jun-2022	40 days	11 days	✓	
Aggregate Organics : Phenols (4AAP) in Water by Colorimetry											
Amber glass total (sulfuric acid) [ON MECP] SW-UF-BH2	E562	14-Jun-2022	15-Jun-2022	28 days	1 days	✓	16-Jun-2022	27 days	1 days	✓	
Anions and Nutrients : Fluoride in Water by IC											
HDPE [ON MECP] SW-UF-BH2	E235.F	14-Jun-2022	16-Jun-2022	----	----		16-Jun-2022	28 days	2 days	✓	
Anions and Nutrients : Sulfate in Water by IC											
HDPE [ON MECP] SW-UF-BH2	E235.SO4	14-Jun-2022	16-Jun-2022	----	----		16-Jun-2022	28 days	2 days	✓	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid) [ON MECP] SW-UF-BH2	E318	14-Jun-2022	16-Jun-2022	----	----		16-Jun-2022	28 days	2 days	✓	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval	
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)											
Amber glass total (sulfuric acid) [ON MECP] SW-UF-BH2	E372-U	14-Jun-2022	16-Jun-2022	----	----		17-Jun-2022	28 days	3 days	✔	
Cyanides : Total Cyanide											
HDPE - total (sodium hydroxide) SW-UF-BH2	E333	14-Jun-2022	16-Jun-2022	----	----		17-Jun-2022	14 days	3 days	✔	
Microbiological Tests : E. coli (MF-mFC-BCIG)											
HDPE (sodium thiosulfate) SW-UF-BH2	E012A.EC	14-Jun-2022	----	----	----		15-Jun-2022	0 hrs	23 hrs	✔	
Nonylphenols : Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode											
Amber glass/Teflon lined cap [ON MECP] SW-UF-BH2	E749B	14-Jun-2022	21-Jun-2022	7 days	7 days	✔	21-Jun-2022	7 days	0 days	✔	
Nonylphenols : Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode											
Amber glass/Teflon lined cap [ON MECP] SW-UF-BH2	E749A	14-Jun-2022	21-Jun-2022	7 days	7 days	✔	21-Jun-2022	7 days	0 days	✔	
Phthalate Esters : BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS											
Amber glass/Teflon lined cap [ON MECP] SW-UF-BH2	E655F	14-Jun-2022	20-Jun-2022	14 days	6 days	✔	21-Jun-2022	40 days	1 days	✔	
Physical Tests : pH by Meter											
HDPE [ON MECP] SW-UF-BH2	E108	14-Jun-2022	16-Jun-2022	----	----		16-Jun-2022	14 days	2 days	✔	
Physical Tests : TSS by Gravimetry											
HDPE [ON MECP] SW-UF-BH2	E160	14-Jun-2022	----	----	----		18-Jun-2022	7 days	4 days	✔	
Polychlorinated Biphenyls : PCB Aroclors by GC-MS											
Amber glass/Teflon lined cap (sodium bisulfate) SW-UF-BH2	E687	14-Jun-2022	21-Jun-2022	14 days	7 days	✔	22-Jun-2022	40 days	1 days	✔	



Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) [ON MECP] SW-UF-BH2	E508	14-Jun-2022	16-Jun-2022	----	----		16-Jun-2022	28 days	2 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) SW-UF-BH2	E420	14-Jun-2022	15-Jun-2022	----	----		16-Jun-2022	180 days	1 days	✓
Volatile Organic Compounds : VOCs (ON List) by Headspace GC-MS										
Glass vial (sodium bisulfate) SW-UF-BH2	E611D	14-Jun-2022	19-Jun-2022	----	----		19-Jun-2022	14 days	5 days	✓

Legend & Qualifier Definitions

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



Quality Control Parameter Frequency Compliance

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

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

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
Analytical Methods							
Laboratory Duplicates (DUP)							
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	524543	1	15	6.6	5.0	✓
E. coli (MF-mFC-BCIG)	E012A.EC	524818	1	14	7.1	5.0	✓
Fluoride in Water by IC	E235.F	526077	1	3	33.3	5.0	✓
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	532554	1	13	7.6	5.0	✓
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	532553	1	13	7.6	5.0	✓
pH by Meter	E108	526075	1	19	5.2	5.0	✓
Phenols (4AAP) in Water by Colorimetry	E562	524985	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	526078	1	4	25.0	5.0	✓
Total Cyanide	E333	526811	1	17	5.8	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	524986	1	20	5.0	5.0	✓
Total Mercury in Water by CVAAS	E508	525751	1	3	33.3	5.0	✓
Total Metals in Water by CRC ICPMS	E420	525412	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	524984	1	19	5.2	5.0	✓
TSS by Gravimetry	E160	528998	1	20	5.0	4.7	✓
VOCs (ON List) by Headspace GC-MS	E611D	529792	1	12	8.3	5.0	✓
Laboratory Control Samples (LCS)							
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	524543	1	15	6.6	5.0	✓
BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS	E655F	530120	1	4	25.0	5.0	✓
Fluoride in Water by IC	E235.F	526077	1	3	33.3	5.0	✓
Mineral Oil & Grease by Gravimetry	E567SG	525512	1	1	100.0	5.0	✓
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	532554	1	13	7.6	5.0	✓
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	532553	1	13	7.6	5.0	✓
Oil & Grease by Gravimetry	E567	525511	1	4	25.0	5.0	✓
PCB Aroclors by GC-MS	E687	532378	1	15	6.6	4.7	✓
pH by Meter	E108	526075	1	19	5.2	5.0	✓
Phenols (4AAP) in Water by Colorimetry	E562	524985	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	526078	1	4	25.0	5.0	✓
Total Cyanide	E333	526811	1	17	5.8	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	524986	1	20	5.0	5.0	✓
Total Mercury in Water by CVAAS	E508	525751	1	3	33.3	5.0	✓
Total Metals in Water by CRC ICPMS	E420	525412	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	524984	1	19	5.2	5.0	✓
TSS by Gravimetry	E160	528998	1	20	5.0	4.7	✓
VOCs (ON List) by Headspace GC-MS	E611D	529792	1	12	8.3	5.0	✓
Method Blanks (MB)							
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	524543	1	15	6.6	5.0	✓
BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS	E655F	530120	1	4	25.0	5.0	✓



Matrix: **Water**

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

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
Analytical Methods							
Method Blanks (MB) - Continued							
E. coli (MF-mFC-BCIG)	E012A.EC	524818	1	14	7.1	5.0	✓
Fluoride in Water by IC	E235.F	526077	1	3	33.3	5.0	✓
Mineral Oil & Grease by Gravimetry	E567SG	525512	1	1	100.0	5.0	✓
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	532554	1	13	7.6	5.0	✓
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	532553	1	13	7.6	5.0	✓
Oil & Grease by Gravimetry	E567	525511	1	4	25.0	5.0	✓
PCB Aroclors by GC-MS	E687	532378	1	15	6.6	4.7	✓
Phenols (4AAP) in Water by Colorimetry	E562	524985	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	526078	1	4	25.0	5.0	✓
Total Cyanide	E333	526811	1	17	5.8	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	524986	1	20	5.0	5.0	✓
Total Mercury in Water by CVAAS	E508	525751	1	3	33.3	5.0	✓
Total Metals in Water by CRC ICPMS	E420	525412	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	524984	1	19	5.2	5.0	✓
TSS by Gravimetry	E160	528998	1	20	5.0	4.7	✓
VOCs (ON List) by Headspace GC-MS	E611D	529792	1	12	8.3	5.0	✓
Matrix Spikes (MS)							
Fluoride in Water by IC	E235.F	526077	1	3	33.3	5.0	✓
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	532554	1	13	7.6	5.0	✓
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	532553	1	13	7.6	5.0	✓
Phenols (4AAP) in Water by Colorimetry	E562	524985	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	526078	1	4	25.0	5.0	✓
Total Cyanide	E333	526811	1	17	5.8	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	524986	1	20	5.0	5.0	✓
Total Mercury in Water by CVAAS	E508	525751	1	3	33.3	5.0	✓
Total Metals in Water by CRC ICPMS	E420	525412	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	524984	1	19	5.2	5.0	✓
VOCs (ON List) by Headspace GC-MS	E611D	529792	1	12	8.3	5.0	✓



Methodology References and Summaries

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

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



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Mercury in Water by CVAAS	E508 Waterloo - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555 Waterloo - Environmental	Water	APHA 5210 B (mod)	Samples are diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter. Nitrification inhibitor is added to samples to prevent nitrogenous compounds from consuming oxygen resulting in only carbonaceous oxygen demand being reported by this method. Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Phenols (4AAP) in Water by Colorimetry	E562 Waterloo - Environmental	Water	EPA 9066	This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide (K ₃ Fe(CN) ₆) and 4-amino-antipyrine (4-AAP) to form a red complex which is measured colorimetrically.
Oil & Grease by Gravimetry	E567 Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane and the extract is evaporated to dryness. The residue is then weighed to determine Oil and Grease.
Mineral Oil & Grease by Gravimetry	E567SG Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane, followed by silica gel treatment after which the extract is evaporated to dryness. The residue is then weighed to determine Mineral Oil and Grease.
VOCs (ON List) by Headspace GC-MS	E611D Waterloo - Environmental	Water	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
BNA (Ontario Sanitary Sewer SVOC Target List) by GC-MS	E655F Waterloo - Environmental	Water	EPA 8270E (mod)	BNA are analyzed by GC-MS.
PCB Aroclors by GC-MS	E687 Waterloo - Environmental	Water	EPA 8270E (mod)	PCB Aroclors are analyzed by GC-MS
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A Waterloo - Environmental	Water	J. Chrom A849 (1999) p.467-482	An aliquot of 5.0 ± 0.10 mL of filtered sample is spiked with Nonylphenol-D ₄ , Nonylphenol Diethoxylate 13C ₆ , and Bisphenol A 13C ₁₂ internal standards and analyzed by LC-MS/MS.
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B Waterloo - Environmental	Water	J. Chrom A849 (1999) p.467-482	Water samples are filtered and analyzed on LCMS/MS by direct injection.



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Animal & Vegetable Oil & Grease by Gravimetry	EC567A.SG Waterloo - Environmental	Water	APHA 5520 (mod)	Animal & vegetable oil and grease is calculated as follows: Oil & Grease (gravimetric) minus Mineral Oil & Grease (gravimetric)
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for TKN in water	EP318 Waterloo - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Digestion for Total Phosphorus in water	EP372 Waterloo - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Oil & Grease Extraction for Gravimetry	EP567 Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane by liquid-liquid extraction.
VOCs Preparation for Headspace Analysis	EP581 Waterloo - Environmental	Water	EPA 5021A (mod)	Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system.
BNA Extraction	EP655 Waterloo - Environmental	Water	EPA 3510C (mod)	SVOCs are extracted from aqueous sample using DCM liquid-liquid extraction.
Pesticides, PCB, and Neutral Extractable Chlorinated Hydrocarbons Extraction	EP660 Waterloo - Environmental	Water	EPA 3511 (mod)	Samples are extracted from aqueous sample using an organic solvent liquid-liquid extraction.
Preparation of Nonylphenol and Nonylphenol Ethoxylates	EP749 Waterloo - Environmental	Water	J. Chrom A849 (1999) p.467-482	An aliquot of 5.0 ± 0.10 mL of filtered sample is spiked with Nonylphenol-D4, Nonylphenol Diethoxylate 13C6, and Bisphenol A 13C12 internal standards and analyzed by LC-MS/MS.

QUALITY CONTROL REPORT

Work Order : **WT2205574**

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Amendment : **2**

Client : Grounded Engineering Inc.
 Contact : Emma Leet
 Address : 1 Banigan Drive
 Toronto ON Canada M4H 1G3
 Telephone : 647 264 7932
 Project : 22-087
 PO : ----
 C-O-C number : 20-951655
 Sampler : AJ
 Site : 4094 TOMKEN RO, MISSISSAUGA
 Quote number : Q88323 - SOA
 No. of samples received : 1
 No. of samples analysed : 1

Laboratory : Waterloo - Environmental
 Account Manager : Amanda Overholster
 Address : 60 Northland Road, Unit 1
 Waterloo, Ontario Canada N2V 2B8
 Telephone : 1 416 817 2944
 Date Samples Received : 14-Jun-2022 17:00
 Date Analysis Commenced : 15-Jun-2022
 Issue Date : 25-Aug-2022 16:54

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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
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Jon Fisher	Department Manager - Inorganics	Waterloo Metals, Waterloo, Ontario

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Work Order : WT2205574 Amendment 2
Client : Grounded Engineering Inc.
Project : 22-087



General Comments

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

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

= Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

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



Laboratory Duplicate (DUP) Report

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

Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 526075)											
WT2205672-001	Anonymous	pH	----	E108	0.10	pH units	8.31	8.35	0.04	Diff <2x LOR	----
Physical Tests (QC Lot: 528998)											
WT2205574-001	SW-UF-BH2	solids, total suspended [TSS]	----	E160	3.0	mg/L	177	185	4.20%	20%	----
Anions and Nutrients (QC Lot: 524984)											
WT2205414-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0093	0.0087	0.0006	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 524986)											
WT2205541-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	1.10	1.08	2.16%	20%	----
Anions and Nutrients (QC Lot: 526077)											
WT2205679-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	1.19	1.19	0.0163%	20%	----
Anions and Nutrients (QC Lot: 526078)											
WT2205679-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	39.5	39.6	0.191%	20%	----
Cyanides (QC Lot: 526811)											
EO2204473-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Microbiological Tests (QC Lot: 524818)											
WT2205574-001	SW-UF-BH2	coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	<1	210	198%	65%	----
Total Metals (QC Lot: 525412)											
WT2205590-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0459	0.0461	0.544%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00021	0.00022	0.00001	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000155	0.0000184	0.0000029	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00079	0.00078	0.000010	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00227	0.00229	1.04%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000640	0.000649	1.38%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00062	0.00058	0.00003	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000148	0.000132	0.000016	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----



Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 525412) - continued											
WT2205590-001	Anonymous	zinc, total	7440-66-6	E420	0.0030	mg/L	0.0101	0.0101	0.00004	Diff <2x LOR	----
Total Metals (QC Lot: 525751)											
WT2205546-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	0.0000152	0.0000157	0.0000005	Diff <2x LOR	----
Aggregate Organics (QC Lot: 524543)											
WT2205574-001	SW-UF-BH2	carbonaceous biochemical oxygen demand [CBOD]	----	E555	2.0	mg/L	<3.0	4.4	37.0%	30%	RRQC
Aggregate Organics (QC Lot: 524985)											
WT2205416-001	Anonymous	phenols, total (4AAP)	----	E562	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 529792)											
WT2205531-001	Anonymous	benzene	71-43-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		chloroform	67-66-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichlorobenzene, 1,2-	95-50-1	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichlorobenzene, 1,4-	106-46-7	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloroethylene, cis-1,2-	156-59-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichloromethane	75-09-2	E611D	1.0	µg/L	<1.0	<1.0	0	Diff <2x LOR	----
		dichloropropylene, trans-1,3-	10061-02-6	E611D	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		methyl ethyl ketone [MEK]	78-93-3	E611D	20	µg/L	<20	<20	0	Diff <2x LOR	----
		styrene	100-42-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tetrachloroethylene	127-18-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		toluene	108-88-3	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		trichloroethylene	79-01-6	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
xylene, m+p-	179601-23-1	E611D	0.40	µg/L	<0.40	<0.40	0	Diff <2x LOR	----		
xylene, o-	95-47-6	E611D	0.30	µg/L	<0.30	<0.30	0	Diff <2x LOR	----		
Nonylphenols (QC Lot: 532553)											
VA22B3407-001	Anonymous	nonylphenols [NP]	84852-15-3	E749A	1.0	µg/L	1.8	1.9	0.10	Diff <2x LOR	----
Nonylphenols (QC Lot: 532554)											
VA22B3407-001	Anonymous	nonylphenol diethoxylates [NP2EO]	n/a	E749B	0.10	µg/L	<0.10	<0.10	0	Diff <2x LOR	----
		nonylphenol monoethoxylates [NP1EO]	n/a	E749B	2.0	µg/L	<2.0	<2.0	0	Diff <2x LOR	----

Qualifiers

Qualifier	Description
RRQC	Refer to report comments for information regarding this QC result.



Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 528998)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 524984)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 524986)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 526077)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 526078)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Cyanides (QCLot: 526811)						
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	<0.0020	----
Microbiological Tests (QCLot: 524818)						
coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	<1	----
Total Metals (QCLot: 525412)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 525751)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Aggregate Organics (QCLot: 524543)						



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Aggregate Organics (QCLot: 524543) - continued						
carbonaceous biochemical oxygen demand [CBOD]	---	E555	2	mg/L	<2.0	---
Aggregate Organics (QCLot: 524985)						
phenols, total (4AAP)	---	E562	0.001	mg/L	<0.0010	---
Aggregate Organics (QCLot: 525511)						
oil & grease (gravimetric)	---	E567	5	mg/L	<5.0	---
Aggregate Organics (QCLot: 525512)						
oil & grease, mineral (gravimetric)	---	E567SG	5	mg/L	<5.0	---
Volatile Organic Compounds (QCLot: 529792)						
benzene	71-43-2	E611D	0.5	µg/L	<0.50	---
chloroform	67-66-3	E611D	0.5	µg/L	<0.50	---
dichlorobenzene, 1,2-	95-50-1	E611D	0.5	µg/L	<0.50	---
dichlorobenzene, 1,4-	106-46-7	E611D	0.5	µg/L	<0.50	---
dichloroethylene, cis-1,2-	156-59-2	E611D	0.5	µg/L	<0.50	---
dichloromethane	75-09-2	E611D	1	µg/L	<1.0	---
dichloropropylene, trans-1,3-	10061-02-6	E611D	0.3	µg/L	<0.30	---
ethylbenzene	100-41-4	E611D	0.5	µg/L	<0.50	---
methyl ethyl ketone [MEK]	78-93-3	E611D	20	µg/L	<20	---
styrene	100-42-5	E611D	0.5	µg/L	<0.50	---
tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.5	µg/L	<0.50	---
tetrachloroethylene	127-18-4	E611D	0.5	µg/L	<0.50	---
toluene	108-88-3	E611D	0.5	µg/L	<0.50	---
trichloroethylene	79-01-6	E611D	0.5	µg/L	<0.50	---
xylene, m+p-	179601-23-1	E611D	0.4	µg/L	<0.40	---
xylene, o-	95-47-6	E611D	0.3	µg/L	<0.30	---
Phthalate Esters (QCLot: 530120)						
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	E655F	2	µg/L	<2.0	---
di-n-butyl phthalate	84-74-2	E655F	1	µg/L	<1.0	---
Nonylphenols (QCLot: 532553)						
nonylphenols [NP]	84852-15-3	E749A	1	µg/L	<1.0	---
Nonylphenols (QCLot: 532554)						
nonylphenol diethoxylates [NP2EO]	n/a	E749B	0.1	µg/L	<0.10	---
nonylphenol monoethoxylates [NP1EO]	n/a	E749B	2	µg/L	<2.0	---
Polychlorinated Biphenyls (QCLot: 532378)						
Aroclor 1016	12674-11-2	E687	0.02	µg/L	<0.020	---
Aroclor 1221	11104-28-2	E687	0.02	µg/L	<0.020	---
Aroclor 1232	11141-16-5	E687	0.02	µg/L	<0.020	---



Sub-Matrix: **Water**

<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>LOR</i>	<i>Unit</i>	<i>Result</i>	<i>Qualifier</i>
Polychlorinated Biphenyls (QCLot: 532378) - continued						
Aroclor 1242	53469-21-9	E687	0.02	µg/L	<0.020	----
Aroclor 1248	12672-29-6	E687	0.02	µg/L	<0.020	----
Aroclor 1254	11097-69-1	E687	0.02	µg/L	<0.020	----
Aroclor 1260	11096-82-5	E687	0.02	µg/L	<0.020	----
Aroclor 1262	37324-23-5	E687	0.02	µg/L	<0.020	----
Aroclor 1268	11100-14-4	E687	0.02	µg/L	<0.020	----



Laboratory Control Sample (LCS) Report

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

Sub-Matrix: Water					Laboratory Control Sample (LCS) Report				
					Spike Concentration	Recovery (%)	Recovery Limits (%)		Qualifier
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 526075)									
pH	----	E108	----	pH units	7 pH units	101	98.0	102	----
Physical Tests (QCLot: 528998)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	108	85.0	115	----
Anions and Nutrients (QCLot: 524984)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.431 mg/L	99.3	80.0	120	----
Anions and Nutrients (QCLot: 524986)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	99.0	75.0	125	----
Anions and Nutrients (QCLot: 526077)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 526078)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Cyanides (QCLot: 526811)									
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	0.25 mg/L	92.9	80.0	120	----
Total Metals (QCLot: 525412)									
aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	100	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	95.4	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	99.1	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	99.3	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	98.3	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	97.7	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	96.2	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	95.1	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	97.4	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	97.3	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	97.2	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	96.4	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	89.6	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	95.8	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	96.9	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	97.4	80.0	120	----
Total Metals (QCLot: 525751)									



Sub-Matrix: Water

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 525751) - continued									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	89.6	80.0	120	----
Aggregate Organics (QCLot: 524543)									
carbonaceous biochemical oxygen demand [CBOD]	----	E555	2	mg/L	198 mg/L	96.5	85.0	115	----
Aggregate Organics (QCLot: 524985)									
phenols, total (4AAP)	----	E562	0.001	mg/L	0.02 mg/L	93.3	85.0	115	----
Aggregate Organics (QCLot: 525511)									
oil & grease (gravimetric)	----	E567	5	mg/L	200 mg/L	80.4	70.0	130	----
Aggregate Organics (QCLot: 525512)									
oil & grease, mineral (gravimetric)	----	E567SG	5	mg/L	100 mg/L	# 66.2	70.0	130	LCS-ND
Volatile Organic Compounds (QCLot: 529792)									
benzene	71-43-2	E611D	0.5	µg/L	100 µg/L	105	70.0	130	----
chloroform	67-66-3	E611D	0.5	µg/L	100 µg/L	109	70.0	130	----
dichlorobenzene, 1,2-	95-50-1	E611D	0.5	µg/L	100 µg/L	102	70.0	130	----
dichlorobenzene, 1,4-	106-46-7	E611D	0.5	µg/L	100 µg/L	109	70.0	130	----
dichloroethylene, cis-1,2-	156-59-2	E611D	0.5	µg/L	100 µg/L	91.7	70.0	130	----
dichloromethane	75-09-2	E611D	1	µg/L	100 µg/L	108	70.0	130	----
dichloropropylene, trans-1,3-	10061-02-6	E611D	0.3	µg/L	100 µg/L	97.8	70.0	130	----
ethylbenzene	100-41-4	E611D	0.5	µg/L	100 µg/L	91.3	70.0	130	----
methyl ethyl ketone [MEK]	78-93-3	E611D	20	µg/L	100 µg/L	88.6	70.0	130	----
styrene	100-42-5	E611D	0.5	µg/L	100 µg/L	91.4	70.0	130	----
tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.5	µg/L	100 µg/L	94.0	70.0	130	----
tetrachloroethylene	127-18-4	E611D	0.5	µg/L	100 µg/L	96.4	70.0	130	----
toluene	108-88-3	E611D	0.5	µg/L	100 µg/L	91.8	70.0	130	----
trichloroethylene	79-01-6	E611D	0.5	µg/L	100 µg/L	98.1	70.0	130	----
xylene, m+p-	179601-23-1	E611D	0.4	µg/L	200 µg/L	98.7	70.0	130	----
xylene, o-	95-47-6	E611D	0.3	µg/L	100 µg/L	91.2	70.0	130	----
Phthalate Esters (QCLot: 530120)									
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	E655F	2	µg/L	6.4 µg/L	130	50.0	140	----
di-n-butyl phthalate	84-74-2	E655F	1	µg/L	6.4 µg/L	110	50.0	140	----
Nonylphenols (QCLot: 532553)									
nonylphenols [NP]	84852-15-3	E749A	1	µg/L	10 µg/L	104	75.0	125	----
Nonylphenols (QCLot: 532554)									
nonylphenol diethoxylates [NP2EO]	n/a	E749B	0.1	µg/L	1 µg/L	117	75.0	125	----



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Nonylphenols (QCLot: 532554) - continued									
nonylphenol monoethoxylates [NP1EO]	n/a	E749B	2	µg/L	20 µg/L	87.7	75.0	125	----
Polychlorinated Biphenyls (QCLot: 532378)									
Aroclor 1016	12674-11-2	E687	0.02	µg/L	0.2 µg/L	95.6	60.0	140	----
Aroclor 1221	11104-28-2	E687	0.02	µg/L	0.2 µg/L	95.6	60.0	140	----
Aroclor 1232	11141-16-5	E687	0.02	µg/L	0.2 µg/L	95.6	60.0	140	----
Aroclor 1242	53469-21-9	E687	0.02	µg/L	0.2 µg/L	95.6	60.0	140	----
Aroclor 1248	12672-29-6	E687	0.02	µg/L	0.2 µg/L	95.8	60.0	140	----
Aroclor 1254	11097-69-1	E687	0.02	µg/L	0.2 µg/L	102	60.0	140	----
Aroclor 1260	11096-82-5	E687	0.02	µg/L	0.2 µg/L	87.0	60.0	140	----
Aroclor 1262	37324-23-5	E687	0.02	µg/L	0.2 µg/L	87.0	60.0	140	----
Aroclor 1268	11100-14-4	E687	0.02	µg/L	0.2 µg/L	87.0	60.0	140	----

Qualifiers

Qualifier	Description
LCS-ND	Lab Control Sample recovery was slightly outside ALS DQO. Reported non-detect results for associated samples were unaffected.



Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 524984)										
WT2205414-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0879 mg/L	0.1 mg/L	87.9	70.0	130	----
Anions and Nutrients (QCLot: 524986)										
WT2205541-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.78 mg/L	2.5 mg/L	111	70.0	130	----
Anions and Nutrients (QCLot: 526077)										
WT2205679-001	Anonymous	fluoride	16984-48-8	E235.F	ND mg/L	1 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 526078)										
WT2205679-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	98.6 mg/L	100 mg/L	98.6	75.0	125	----
Cyanides (QCLot: 526811)										
EO2204473-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.254 mg/L	0.25 mg/L	102	70.0	130	----
Total Metals (QCLot: 525412)										
WT2205590-002	Anonymous	aluminum, total	7429-90-5	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		antimony, total	7440-36-0	E420	0.0503 mg/L	0.05 mg/L	101	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0524 mg/L	0.05 mg/L	105	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00520 mg/L	0.005 mg/L	104	70.0	130	----
		chromium, total	7440-47-3	E420	0.0128 mg/L	0.0125 mg/L	103	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0128 mg/L	0.0125 mg/L	103	70.0	130	----
		copper, total	7440-50-8	E420	0.0121 mg/L	0.0125 mg/L	96.6	70.0	130	----
		lead, total	7439-92-1	E420	0.0239 mg/L	0.025 mg/L	95.7	70.0	130	----
		manganese, total	7439-96-5	E420	0.0124 mg/L	0.0125 mg/L	99.3	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0130 mg/L	0.0125 mg/L	104	70.0	130	----
		nickel, total	7440-02-0	E420	0.0257 mg/L	0.025 mg/L	103	70.0	130	----
		selenium, total	7782-49-2	E420	0.0502 mg/L	0.05 mg/L	100	70.0	130	----
		silver, total	7440-22-4	E420	0.00468 mg/L	0.005 mg/L	93.6	70.0	130	----
		tin, total	7440-31-5	E420	0.0246 mg/L	0.025 mg/L	98.4	70.0	130	----
		titanium, total	7440-32-6	E420	0.0123 mg/L	0.0125 mg/L	98.3	70.0	130	----
		zinc, total	7440-66-6	E420	0.0244 mg/L	0.025 mg/L	97.4	70.0	130	----
Total Metals (QCLot: 525751)										
WT2205574-001	SW-UF-BH2	mercury, total	7439-97-6	E508	0.0000940 mg/L	0.0001 mg/L	94.0	70.0	130	----
Aggregate Organics (QCLot: 524985)										
WT2205416-001	Anonymous	phenols, total (4AAP)	----	E562	0.0198 mg/L	0.02 mg/L	98.9	75.0	125	----



Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Volatile Organic Compounds (QCLot: 529792)										
WT2205531-001	Anonymous	benzene	71-43-2	E611D	98.1 µg/L	100 µg/L	98.1	60.0	140	----
		chloroform	67-66-3	E611D	103 µg/L	100 µg/L	103	60.0	140	----
		dichlorobenzene, 1,2-	95-50-1	E611D	96.3 µg/L	100 µg/L	96.3	60.0	140	----
		dichlorobenzene, 1,4-	106-46-7	E611D	103 µg/L	100 µg/L	103	60.0	140	----
		dichloroethylene, cis-1,2-	156-59-2	E611D	85.1 µg/L	100 µg/L	85.1	60.0	140	----
		dichloromethane	75-09-2	E611D	99.8 µg/L	100 µg/L	99.8	60.0	140	----
		dichloropropylene, trans-1,3-	10061-02-6	E611D	86.8 µg/L	100 µg/L	86.8	60.0	140	----
		ethylbenzene	100-41-4	E611D	84.1 µg/L	100 µg/L	84.1	60.0	140	----
		methyl ethyl ketone [MEK]	78-93-3	E611D	79 µg/L	100 µg/L	79.1	60.0	140	----
		styrene	100-42-5	E611D	83.4 µg/L	100 µg/L	83.4	60.0	140	----
		tetrachloroethane, 1,1,2,2-	79-34-5	E611D	86.0 µg/L	100 µg/L	86.0	60.0	140	----
		tetrachloroethylene	127-18-4	E611D	88.0 µg/L	100 µg/L	88.0	60.0	140	----
		toluene	108-88-3	E611D	84.6 µg/L	100 µg/L	84.6	60.0	140	----
		trichloroethylene	79-01-6	E611D	90.6 µg/L	100 µg/L	90.6	60.0	140	----
		xylene, m+p-	179601-23-1	E611D	184 µg/L	200 µg/L	91.9	60.0	140	----
		xylene, o-	95-47-6	E611D	84.4 µg/L	100 µg/L	84.4	60.0	140	----
Nonylphenols (QCLot: 532553)										
VA22B3407-001	Anonymous	nonylphenols [NP]	84852-15-3	E749A	10.5 µg/L	10 µg/L	105	60.0	140	----
Nonylphenols (QCLot: 532554)										
VA22B3407-001	Anonymous	nonylphenol diethoxylates [NP2EO]	n/a	E749B	1.11 µg/L	1 µg/L	111	60.0	140	----
		nonylphenol monoethoxylates [NP1EO]	n/a	E749B	22.0 µg/L	20 µg/L	110	60.0	140	----

Report To: **Groundwater Environmental**

Company: **Groundwater Environmental**

Contact: **Sam Bastian**

Phone: **416-291-1613**

Street: **1 BAYVIEW DR**

City/Province: **TORONTO, ON**

Postal Code: **M2H 2E9**

Invoice To: **Same as Report To**

Company: **Groundwater Environmental**

ALS Account # / Quote #: **22-057**

Job #: **22-057**

PO / A/E: **4094 TORKEN RD / MISSISSAUGA**

LSD: **WT 2205574 501**

ALS Sample # (ALS use only): **SW-UF-BH2**

Sample Identification and/or Coordinates (This description will appear on the report): **SW-UF-BH2**

ALS Contact: **AS**

Date: **14-JUN-22**

Time: **15:30**

Sample Type: **GW**

Sampler: **AS**

Location: **4094 TORKEN RD / MISSISSAUGA**

Requester: **Groundwater Environmental**

Major/Minor Code: **Oil and Gas Required Fields (client use)**

Routing Code: **Oil and Gas Required Fields (client use)**

Requester: **Groundwater Environmental**

Requester: **Groundwater Environmental**

Requester: **Groundwater Environmental**

Requester: **Groundwater Environmental**

Requester: **Groundwater Environmental**

Reports / Recipients

Select Report Format: **PDF**

Combine Results to Criteria on Report: **NO**

Select Distribution: **EMAIL**

Email 1 or Fax: **elect@groundwater.ca**

Email 2: **elect@groundwater.ca**

Email 3: **elect@groundwater.ca**

Select Invoice Distribution: **EMAIL**

Email 1 or Fax: **elect@groundwater.ca**

Email 2: **elect@groundwater.ca**

Email 3: **elect@groundwater.ca**

Turnaround Time (TAT) Requested

1 day [P1] if received by 3pm M-F - no surcharge apply

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

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

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

Same day [E] if received by 10am M-S - 200% rush surcharge. Additional may apply for rush requests on weekends, statutory holidays and non-routine

Date and Time Required for all E&E TATs:

For all tests with rush TATs requested, please contact

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (FP)

Analysis Request

NUMBER OF CONTAINERS

20

SEWER USE

PEEL REGION STORM

AND SANITARY COMBINED

SAMPLES ON HOLD

EXTENDED STORAGE REQUIRED

SUSPECTED HAZARD (see

Environmental Division

Waterloo

Work Order Reference

WT2205574

Barcode

Telephone: + 1 519 886 6910

Drinking Water (DW) Samples (client use)

Are samples taken from a Regulated DW System? **NO**

Are samples for human consumption/ use? **NO**

SHIPMENT RELEASE (client use)

Released by: **MS**

Date: **14-JUN-22**

Time: **15:30**

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

Peel Storm and Sanitary Combined

SHIPMENT RECEPTION (ALS use only)

Date: **06/14/22**

Time: **17:06**

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: **ICE**

Submission Comments identified on Sample Receipt Notification: **Peel Storm and Sanitary Combined**

COOLING INITIATED

COOLER CUSTODY SEALS INTACT: **YES**

COOLER TEMPERATURES: **3.6**

COOLER TEMPERATURES: **3.6**

SHIPMENT RECEPTION (ALS use only)

Date: **06/15/22**

Time: **10:50**

Received by: **QA**

Time: **10:50**

Received by: **QA**

Date: **06/15/22**

Time: **10:50**

Received by: **QA**

Date: **06/15/22**

Time: **10:50**

Received by: **QA**

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APPENDIX F

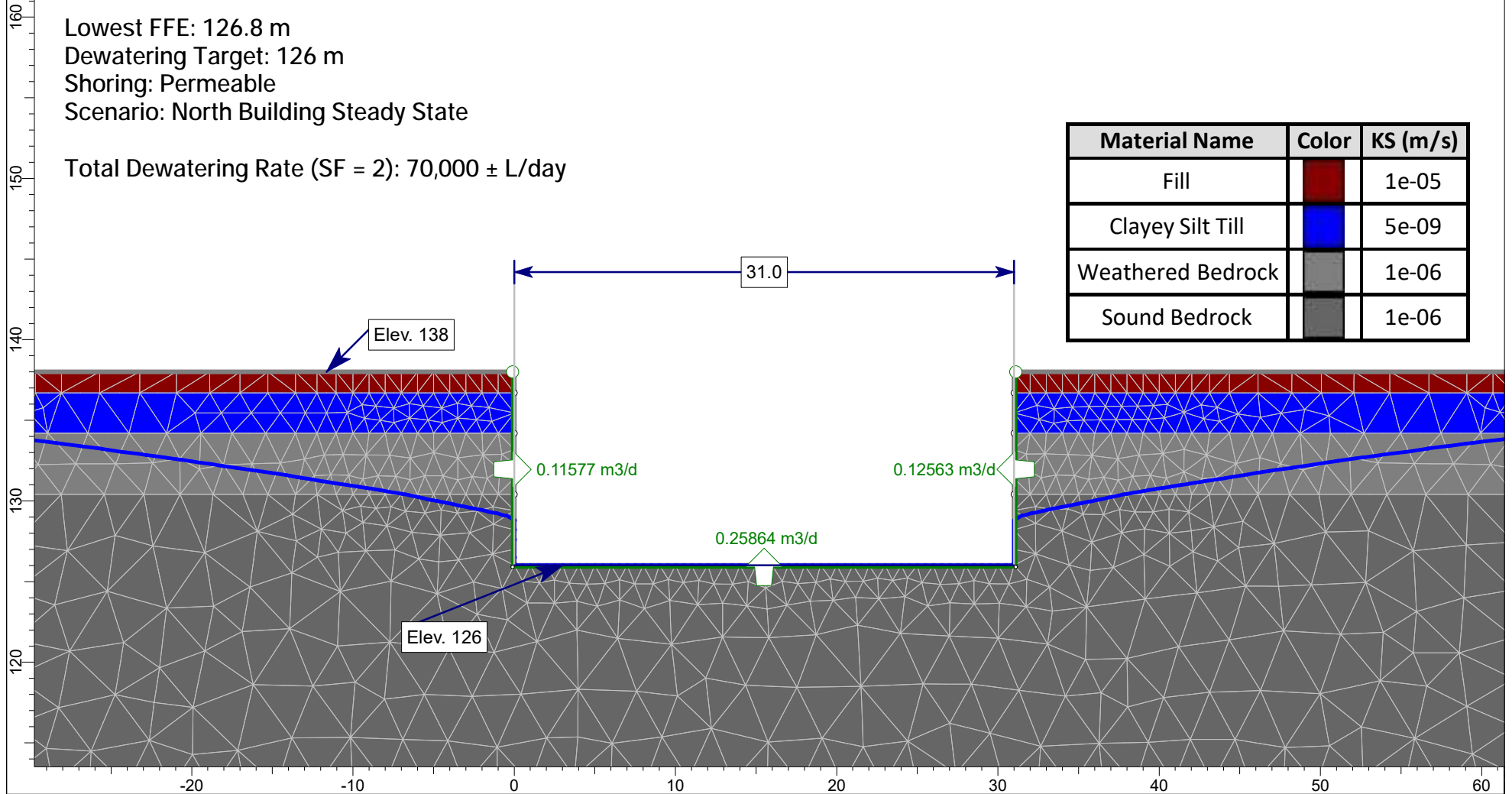



Excavation Dims (Equiv. Rectangle): 31 m by 51 m
 Perimeter: 164 m
 Equiv Area: 1,581 m²

Lowest FFE: 126.8 m
 Dewatering Target: 126 m
 Shoring: Permeable
 Scenario: North Building Steady State

Total Dewatering Rate (SF = 2): 70,000 ± L/day

Material Name	Color	KS (m/s)
Fill		1e-05
Clayey Silt Till		5e-09
Weathered Bedrock		1e-06
Sound Bedrock		1e-06



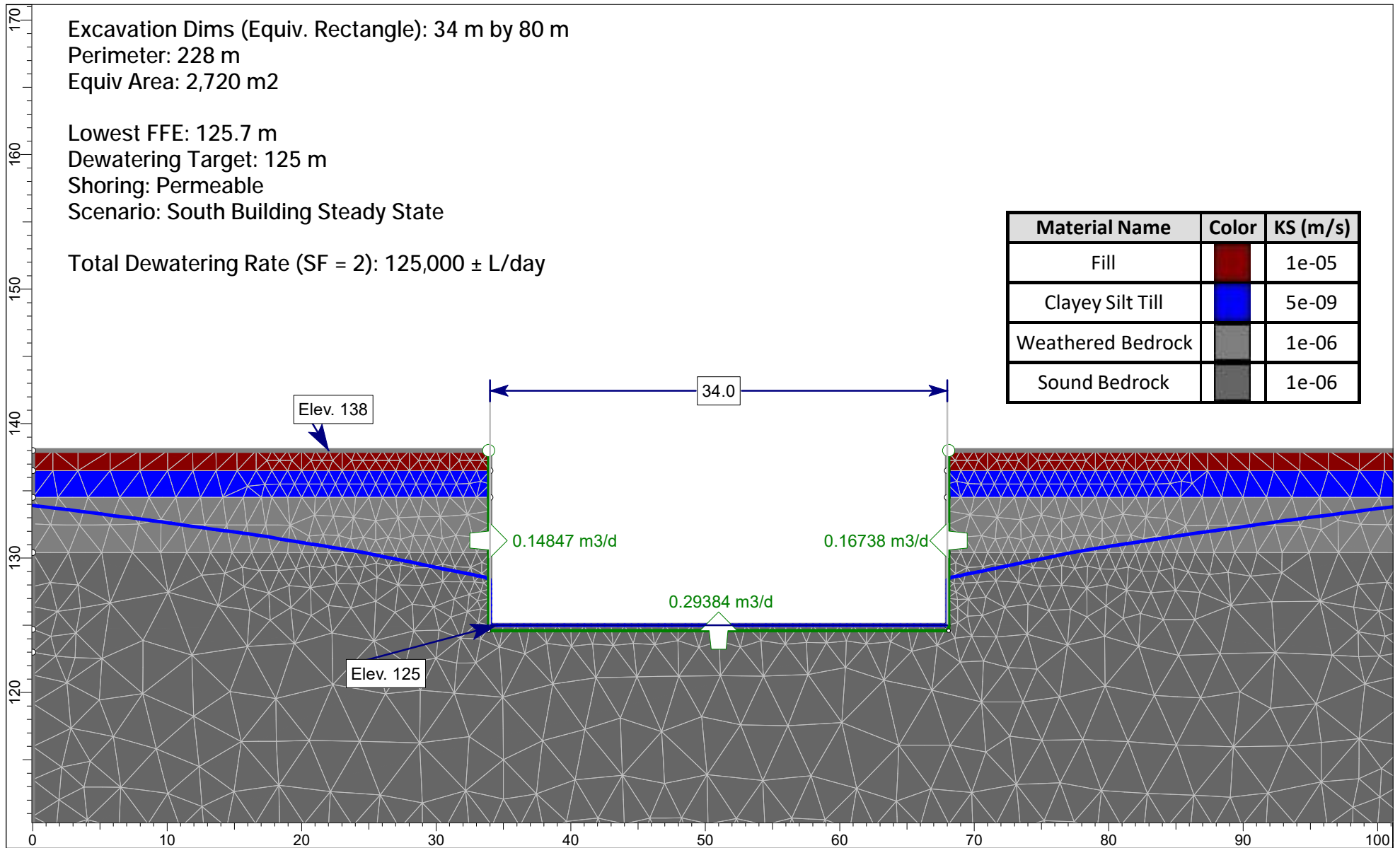
	File	22-087 - UPRC - Westminster - 4094 Tomken Road		
	Analysis	Steady State FEM: North Building Steady State		
	Ref.			
	RS2 File	22-087 FEM.slmd	Scale	1:358
		Eng	NP	

Excavation Dims (Equiv. Rectangle): 34 m by 80 m
 Perimeter: 228 m
 Equiv Area: 2,720 m²

Lowest FFE: 125.7 m
 Dewatering Target: 125 m
 Shoring: Permeable
 Scenario: South Building Steady State

Total Dewatering Rate (SF = 2): 125,000 ± L/day

Material Name	Color	KS (m/s)
Fill	Red	1e-05
Clayey Silt Till	Blue	5e-09
Weathered Bedrock	Grey	1e-06
Sound Bedrock	Dark Grey	1e-06



	File	22-087 - UPRC - Westminster - 4094 Tomken Road		
	Analysis	Steady State FEM: South Building Steady State FEM		
	Ref.			
	RS2 File	22-087 FEM.slmd	Scale	1:398
		Eng	NP	

APPENDIX G



SHORT TERM - NORTH BUILDING STEADY STATE

Excavation Dimensions [m]	
N-S	51
E-W	31
Area (m ²)	1581
Perimeter (m)	164

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

Section	Flow [m ³ /day]	Length [m]	Volume [L/day]
Base	0.25864	51	13,191
Sides	0.12563	164	20,603
Total			33,794
Factor of Safety	2.0		67,588

Storm Events	
2 Year [L/day]	100 Year [L/day]
39,525	149,000

Summary	L/day	L/min
Groundwater	70,000	48.6
Rainfall	40,000	27.8
Total	110,000	76.4

LONG TERM - NORTH BUILDING STEADY STATE

Excavation Dimensions [m]	
N-S	51
E-W	31
Area (m ²)	1581
Perimeter (m)	164

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

Section	Flow [m ³ /day]	Length [m]	Volume [L/day]
Base	0.25864	51	13,191
Sides	0.12563	164	20,603
Total			33,794
Factor of Safety	2.0		67,588

Infiltration [L/day]
3555

Summary	L/day	L/min
Groundwater	70,000	48.6
Infiltration	4,000	2.8
Total	74,000	51.4

SHORT TERM - SOUTH BUILDING STEADY STATE

Excavation Dimensions [m]	
N-S	80
E-W	34
Area (m ²)	2720
Perimeter (m)	228

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

Section	Flow [m ³ /day]	Length [m]	Volume [L/day]
Base	0.29384	80	23,507
Sides	0.16738	228	38,163
Total			61,670
Factor of Safety	2.0		123,340

Storm Events	
2 Year [L/day]	100 Year [L/day]
68,000	256,000

Summary	L/day	L/min
Groundwater	125,000	86.8
Rainfall	68,000	47.2
Total	193,000	134.0

LONG TERM - SOUTH BUILDING STEADY STATE

Excavation Dimensions [m]	
N-S	80
E-W	34
Area (m ²)	2720
Perimeter (m)	228

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

Section	Flow [m ³ /day]	Length [m]	Volume [L/day]
Base	0.29384	80	23,507
Sides	0.16738	228	38,163
Total			61,670
Factor of Safety	2.0		123,340

Infiltration [L/day]
10327.5

Summary	L/day	L/min
Groundwater	125,000	86.8
Infiltration	11,000	7.6
Total	136,000	94.4