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**HYDROGEOLOGICAL INVESTIGATION**



400 Esna Park Drive, Unit 15  
Markham, ON  
L3R 3K2

Tel: (905) 475-7755  
Fax: (905) 475-7718  
[www.fisherenvironmental.com](http://www.fisherenvironmental.com)

**5210 INNES ROAD, OTTAWA, ONTARIO,**

Prepared for:  
Dymon Group of Companies

Project No. FE-P 22-12470H

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2-1830 Walkley Road,  
Ottawa, Ontario K1H, 8K3

**Contact:** James Byck, B.Arch., C.E.T  
[jbyck@dymon.ca](mailto:jbyck@dymon.ca)

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**Project Address:** 5210 Innes Road, Ottawa, Ontario

**Project Number:** FE-P 22-12470H

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**Project Manager:  
(Primary Contact)**

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Sean Fisher, M.Sc. Eng.,  
Project Manager,  
[sean@fishereng.com](mailto:sean@fishereng.com)



**Report Prepared By:**

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Clive Wiggan, PhD., PMP.,  
Project Manager  
[clive@fishereng.com](mailto:clive@fishereng.com)



The seal is circular with the text "LICENSED PROFESSIONAL ENGINEER" around the top edge and "PROVINCE OF ONTARIO" around the bottom edge. In the center, it reads "M. FAN" and "100154673".

**Report Reviewed By:**

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Frank Fan, PEng.,  
Geotechnical Engineer  
[frank@fishereng.com](mailto:frank@fishereng.com)

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## 1. INTRODUCTION

Fisher Engineering Limited was retained by Dymon Group of Companies to carry out a hydrogeological investigation for the proposed redevelopment at the property located at 5210 Innes Road, Ottawa, Ontario, hereinafter referred to as the 'Site'.

The purpose of the Hydrogeological Investigation was to evaluate groundwater conditions with respect to the redevelopment of the site.

The Hydrogeological Review has been prepared in accordance with the Ontario Water Resources Act, Ontario Regulation 387/04 and Ontario Ottawa Sanitary and Storm Sewer By-Law No.2003-514 (2003).

The report has been prepared specifically and solely for the proposed development regarding hydrogeological aspects for design and construction.

## 2. SITE AND PROJECT DESCRIPTIONS

### Site Settings

The site is located at the southeast corner of the intersection of Innes Road and Trim Road in Ottawa, and is bounded by Innes Road to the north, industrial properties to the east & south and Trim Road to the west, beyond which are commercial properties.

The subject property was vacant and covered with grass during the investigation and an approximate area of 12,986m<sup>2</sup>.

### Topography

The site is fairly flat and is approximately 0.6 to 1.0m below the adjacent roadways (Innes Road and Trim Road). Ground surface elevations vary from approximately 87.67m to 88.01m asl based on the topographic survey plan provided to Fisher.

### Proposed Development

Site Plans, prepared by DCA- A Group of Architect, dated July 13, 2022, provided to Fisher during the current investigation show the proposed development consisting of a 3-storey, 18m high self- storage building with no underground levels. The proposed building will be located in the centre of the property with a footprint of 5,666m<sup>2</sup>. Finished Floor Elevation (FFE) was given as 87.75m asl.



### 3. SCOPE OF HYDROGEOLOGICAL INVESTIGATION

The Hydrogeological Investigation works were required to:

- 1) Establish groundwater conditions for the design of dewatering works, if required, prior to construction of the proposed building.
- 2) Determine the need for permanent drainage and
- 3) Conduct calculations/analyses of the groundwater quantity and quality to be used for the necessary applications for permits prior to proceeding with construction dewatering and design of permanent drainage, if necessary.

The scope of this work generally consisted of the following:

- **Drilling/locating Monitoring Wells.** Drilling of monitoring wells and reviewing / compiling the borehole logs and onsite / laboratory testing.
- **Data Evaluation.** Evaluating the results of soil types, groundwater static levels, ground surface elevation, groundwater quality, flow direction and other available hydrogeological data for the site and their potential impact on the proposed development.
- **Private Well Survey.** Carry out a search of the MECP records to ascertain the number of private water wells within 500m of the site and determine the impact of construction on these wells.
- **Hydraulic Conductivity Tests.** Conduct single well response tests and record groundwater level drawdown and recovery to model/calculate hydraulic conductivity.
- **Groundwater Quality Analysis.** Carry out laboratory analyses on soil and groundwater to determine compliance with the Ontario Ottawa Sanitary and Storm Sewer, By-Law No. 2003-514 (2003).
- **Hydrogeological Report.** Prepare and submit a report detailing the findings and recommendations of the Hydrogeological Investigation.



#### **4. FIELD AND LABORATORY WORKS**

Subsurface exploration for the hydrogeological Investigation was conducted concurrent with drilling for a Geotechnical investigation on September 20 - 23, 2022, and consisted of six (6) boreholes, BH101 to BH106, advanced to depths of 6.55m to 32.33m (corresponding elevations from 81.12m to 55.45m asl). Monitoring wells were installed in five (5) of the boreholes for groundwater level monitoring, sampling and testing purposes. The wells were constructed with 3.05m (10') long, 51mm diameter PVC slotted screen pipes, with the base at approximate depths as shown in the logs of boreholes at Appendix B. A clean silica sand pack was placed around each well screen which was isolated with bentonite extending to slightly below existing grade. Two (2) shallow test wells were installed for infiltration testing.

Boreholes were advanced using solid stem augurs or mud rotary and the subsurface strata sampled at regular intervals using a split-spoon sampler following the procedure as detailed in ASTM Standard specification D1586 for Standard Penetration Test. Field tests to determine the engineering parameters of the soil were carried out during drilling, which included Standard Penetration Tests (SPT). Approximate locations of the boreholes are shown on the Borehole Location Plan in Appendix A.

##### **Laboratory Analyses**

Seven (7) representative soil samples from BH1, BH2 and BH3 were selected and submitted to Fisher Environmental laboratory for moisture content analyses during the initial geotechnical investigation. Six (6) samples from BH102, BH103 and BH104 were submitted for grain size, moisture and hydrometer analyses. The laboratory samples were tested and classified in general accordance with the Unified Soil Classification System, ASTM D 2487, and Standard Practice for Classification of Soil for Engineering Purposes. Laboratory test results are presented in Appendix C.

The soil samples recovered during the investigation will be stored in the Fisher Engineering laboratory for 30 days after submitting the report and will be discarded thereafter unless instructed otherwise.

##### **Site Survey**

Elevations at borehole/monitoring well locations were established by interpolating from a topographic survey plan, by Annis, O'Sullivan, Vollebakk Ltd, dated November 10, 2021, which was provided to Fisher during the investigation.



## 5. SUBSOIL CONDITIONS

Surface and subsurface conditions encountered at borehole locations are shown in Appendix B - Log of Boreholes and are summarized in the following sections. The logs include stratification at borehole locations along with detailed soil descriptions. Variations in soil stratification may occur and should be expected between borehole locations and elsewhere on the site.

**Fill/Topsoil** – A layer of dark brown clayey silt / topsoil was encountered in BH1 and BH3 to depth of 0.61m and was underlain by brown to greyish brown silty clay fill to maximum depth of 1.22m bgs. The encountered fill layers were moist, except in BH2, where the upper 0.60m was wet. SPT 'N' values were generally from 1 to 4 blows per 300mm penetration in the upper section of organic fill/topsoil changing to 9 to 11 blows per 300mm penetration in the lower section consisting of clayey silt. Moisture content in the lower section ranged from 34 to 37%. Fill depths/elevations are presented in Table 1.

**Silty Clay to Clay** – Brown to grey silty clay to clay deposits were encountered in all boreholes below the fill / organic topsoil. Standard penetration test (SPT) was advanced to 6.55m bgs in these layers with SPT 'N' values ranging from 14 to 0 blows per 300mm penetration and generally 0 to 4 blows at 2.5m indicating a very soft to stiff consistency. Moisture content ranged from 43 to 73% from the samples obtained in the section.

**Clay with Gravel** – Grey, wet, soft clay with, layers of gravelly sand and pieces of rock, was encountered in BH101 below the soft clay, extending to approximate depth of 22.86m bgs.

**Gravelly Sand** – Grey, wet, very dense gravelly sand, with pieces of crushed rock, was encountered below the soft clay/depth of 27.43m in BH106 extending to approximate depth of 31.39m bg.

**Crushed Rock Material** – Grey, dry, crushed rock material with some clay/silt was encountered in BH101 and BH106 below the clayey gravelly sand extending to respective termination depths of 24.41m and 32.33m bgs. SPT 'N' values ranged from 26 to auger refusal at over 100 blows per 300mm indicating a very stiff to hard/very dense condition.

**Bedrock** – Refusal to auguring was encountered at depths of 24.41m and 32.33m in BH101 and BH106 respectively. Based on information available on the geological data for BH (ID 616330, drilled on the property across Trim Road) bedrock was encountered at depth of 39m.



**Table 1: Fill depths and Elevations**

Borehole No.	BH101	BH102	BH103	BH104	BH105	BH106	BH1	BH2	BH3
Surface Elevation (m asl)	87.84	87.67	87.94	87.96	87.90	87.78	87.90	88.00	87.85
Depth of Borehole (m)	8.08	8.08	8.08	14.18	13.72	8.08	18.29	25.30	24.99
Elevation at Bottom of Borehole (m asl)	79.76	79.59	79.86	73.78	74.18	79.70	69.61	62.70	62.86
Depth of Fill/topsoil (m)	n/a	1.07	0.91	0.91	0.69	n/a	1.22	1.07	1.22
Elevation at Bottom of Fill (m asl)	n/a	86.60	87.03	87.05	87.21	n/a	86.68	86.93	86.63

## 6. HYDROGEOLOGICAL STUDY

A hydrogeological study for the subject site was conducted based on the boreholes/wells' exploration, observation and site/laboratory testing. Groundwater details from the five (5) newly installed monitoring wells were used in the Hydrogeological Study. The wells were constructed generally with 3.05m (10') long, 51mm diameter PVC slotted screen pipes, with the bases at approximate depths below existing grade as shown in Appendix B. Clean silica sand packs were placed around each well screen which was isolated with bentonite extending to slightly below existing grade.

Boreholes were advanced using dry auguring with mud rotary used for deeper boreholes. Subsoils and groundwater conditions were observed and recorded during the field investigation. Standing water was observed at depths of 0.61m to 4.88m below prevailing grade in five of the open boreholes while two were dry on completion of drilling.

### 6.1 Hydrogeological Conditions

Review of the available surficial geological and hydrogeological information for the area shows that the soils comprise generally of Fine-textured glaciomarine deposits of silt and clay, minor sand and gravel: massive to well laminated (Ontario Geological Survey Map). Underlying bedrock is represented by limestone, dolostone, shale, arkose and sandstone of the Ottawa Group: Simcoe Group: and Shadow Lake Formation. Depth to bedrock in the area is generally more than 40m below grade. Surficial geology maps are presented in Appendix A.





The site subsoils and hydrogeological conditions were observed and recorded during both the geotechnical and hydrogeological investigations. Based on the boreholes/wells' exploration, the subsurface soils on the site were dominated by grey/brown silty clay underlain by clay with coarse sand/gravel and possibly rock at further depths.

All monitoring wells were purged/developed and allowed to fully recover prior to carrying out groundwater level measurements and sampling. Measured groundwater depths and elevations are summarized in Table 2.

**Table 2: Groundwater Depths and Elevations**

Monitoring Well No.	BH(MW)101	BH(MW)102	BH103	BH(MW)104	BH(MW)105	BH(MW)106	BH1	BH2	BH3	
Surface Elevation (m asl)	87.84	87.67	87.94	87.96	87.90	87.78	87.90	88.00	87.85	
Depth of Well, m bgs	6.10	6.10	n/a	6.10	6.10	6.10	n/a	n/a	n/a	
Elevation at well base, m asl	81.74	81.57		81.86	81.80	81.68				
Depth of BH, m bgs	24.41	6.55	6.55	6.55	6.55	32.33	18.29	25.30	24.99	
Elevation at borehole base, m asl	63.43	81.12	81.39	81.41	81.35	55.45	69.61	62.70	62.86	
In open borehole on Completion	GW level, m bgs	n/a - mud rotary	Dry	3.55	4.88	Dry	n/a - mud rotary	5.49	1.52	0.61
	GW Ele, m asl			84.39	83.08			82.41	86.48	87.24
6-Oct-22	GW level, m bgs	1.92	1.74	n/a	2.07	2.09	2.36	n/a	n/a	n/a
	GW Ele, m asl	85.92	85.93		85.89	85.81	85.42			

**Comments on Table 2:**

The following general comments regarding groundwater conditions at the site are based on the groundwater level data and the geotechnical investigation:

- Standing water was observed at depths of 0.61m to 4.88m below prevailing grade in open boreholes BH1 to BH3, BH103 and BH104. Boreholes BH102 and BH105 were dry on completion of drilling. Boreholes BH101 and BH106 were drilled using mud rotary and consequently groundwater conditions on completion of drilling could not be ascertained.



- Static groundwater levels were measured at 1.74m to 2.36m bgs (elevation from 85.42m to 85.93m asl) in the shallow monitoring wells (well base from 81.57m to 84.91m asl).
- Groundwater flow is towards southeast with an approximate gradient of 1.95%.
- The nearest body of surface water is the Cardinal Creek located approximately 1.1km east of the site.
- The site is located in a developed residential neighborhood, with water supply via municipal water system. Some older supply wells are shown on the Ministry's well records portal, but these may have been decommissioned and not reported.

## 6.2 Hydraulic Conductivity K Modeling Results

### Rising Head Slug Tests

Rising head slug tests (SWRT) were carried out in monitoring wells, MW101, MW104 and MW106, on October 6, 2022. The water bearing media consisted mainly of clayey silt/silty clay to clay at various depths, and were assumed to be unconfined, homogenous, isotropic and of uniform thickness. It was also assumed that the wells fully penetrated the water bearing soils. Data from the rising head tests were used to calculate the hydraulic conductivity values using Luthin's method.

Calculated values for hydraulic conductivity (k) are summarized in Table 3 and are generally representative of the water bearing soils consisting of clayey/silty soils within the screened depths and also varied with occasional interbedded wet seams. Details of the hydraulic conductivity analyses are presented in Appendix C.

**Table 3: Summary of Single Well Response Tests and Hydraulic Conductivity Results**

Test Wells	Well Surface Elevation (m asl)	Groundwater Depth (m)	Screen Elevation (m asl)	Variance of water head created (m)	30 Minutes/ Recovery Percentage	Hydraulic Conductivity, K (Luthin's Method)	
						m/s	m/day
MW101	87.84	2.68	81.74 – 84.79	2.430	31 min / 16%	$6.5 \times 10^{-7}$	0.052
MW104	87.96	2.82	81.86 – 84.91	2.763	31 min / 15%	$4.54 \times 10^{-7}$	0.039
MW106	87.78	2.59	81.68 – 84.73	3.141	31 min / 2%	$4.54 \times 10^{-8}$	0.004



### 6.3 Grain Size Analysis for Hydraulic Conductivity K

Representative soil samples from BH1, BH4, BH5 and BH8 were selected from depths associated with typical conventional footing locations or change in soil stratigraphy and submitted to the laboratory for grain size distribution and hydrometer analyses. Coefficient of permeability,  $k$  in cm/sec and corresponding percolation  $T$ , in mins/cm were estimated from Table 3 of the Supplementary Guidelines to the Ontario Building Code 1997. The results of the grain size distribution and hydrometer analyses are presented in Appendix C and summarized in Table 4.

**Table 4: Hydraulic Conductivity Estimated from Grain Size Analysis**

Location	Depth of soil sample (m)	Soil Classification	Estimated Coefficient of Permeability cm/sec	Percolation Rate, T – mins/cm
BH2	1.53 – 1.98	Silty Clay (CL)	$10^{-6}$ or less	Over 50
BH3	1.53 – 1.98	Silty Clay, trace Sand (ML)	$10^{-5}$ – $10^{-6}$	20 - 50
BH4	0.76 – 1.22	Silty Clay, trace Sand (ML)	$10^{-5}$ – $10^{-6}$	20 - 50
TH1	1.53 – 1.98	Silty Clay (CL)	$10^{-6}$ or less	Over 50
TH2	1.53 – 1.98	Silty Clay (CL)	$10^{-6}$ or less	Over 50

## 7. CONSTRUCTION DEWATERING & PERMANENT DRAINAGE

### 7.1 Construction Dewatering

The proposed development will consist of a three-storey self-storage building with no underground level. Finished floor elevation is 87.75m asl. Deep foundations are proposed however conventional footings for slab on grade, or grade beam typically used with deep foundations, would be expected at approximately 1.5m below prevailing grade for frost protection. Gross floor area for the ground floor level is approximately 5,666m<sup>2</sup>.

Based on the geotechnical investigation, conventional spread/strip footings or grade beams for deep foundations, if used, would generally be 1.5m below ground floor at an average elevation of 86.25m asl. Groundwater elevations vary between 85.42m and 85.93m asl. This means that the footings/grade beams would be slightly above the groundwater levels observed in the monitoring wells. Groundwater levels should therefore be lowered generally to 1m below the designed footing depths to protect footing



subgrade from hydraulic pressure disturbance during construction. The highest observed groundwater elevation (85.93m asl) was used to estimate construction groundwater dewatering rate. An average hydraulic conductivity value of  $3.68 \times 10^{-7}$  m/s, obtained from rising head slug tests in three shallow monitoring wells (MW101, MW104 & MW106) was used to estimate groundwater discharge rates.

Based on the calculations, shown in Appendix F, a construction groundwater dewatering flowrate of **4.52 m<sup>3</sup>/day (4,520 L/day)** was obtained for an average conventional footing/grade beam elevation of 86.25m asl with an excavation area of 5,666m<sup>2</sup>. Factored construction groundwater dewatering flowrate of **6.78 m<sup>3</sup>/day (6,780 L/day)** is applicable with the given footing elevation (**FS of 1.5**).

#### Seasonal High Groundwater Levels

Groundwater levels were measured during the month of October. The highest groundwater level observed in the shallow monitoring wells was used to estimate construction dewatering. The highest groundwater level was increased by 0.5m and used to estimate permanent drainage rate.

#### Accounting for Accumulated Precipitation

Provisions should be made to pump accumulated water from the excavation areas during construction, particularly following a period of heavy rainfall. For example, 25mm rainfall in 24 hrs may result in accumulation of up to 141.65m<sup>3</sup> in the excavated area. Subsurface soils at the expected excavation depth are dominated by silty clay to clay. Consequently, some ponding of rainwater may be expected. A conservative accumulated volume of **50 m<sup>3</sup>/day** may therefore be assumed for planning purposes. Accumulated precipitation may be stored on site for subsequent disposal to an MECP-licensed facility. If the water is to be discharged into the public sewer system, then an application for the discharge of private water will have to be made to City of Ottawa. The water quality, at the time of the application, will need to be ascertained to ensure compliance with the Ontario Ottawa Sanitary and Storm Sewer By-Law No. 2003-514 (2003).

*Maximum construction discharge rates, taking into consideration accumulated precipitation volumes, are **54,520 L/day (unfactored)** and **56,780 L/day (factored)**.*

## **7.2 Permanent Drainage**

For the building with no underground level, FFE is 87.75m asl. The highest observed groundwater elevation is 85.93m observed during October. In the absence of long-term groundwater level monitoring the highest observed groundwater level was increased by 1.0m to 86.93m in order to estimate the



requirements for permanent drainage. Under these conditions, permanent drainage will still not be required for the building with no underground level.

It should be noted however perimeter and under-slab drainage should be provided for any subsurface portion of the building, such as below grade loading docks and elevator shafts, which are within 1m of the highest observed groundwater level. A nominal groundwater discharge rate of 2m<sup>3</sup>/day should be used for planning purposes.

*An application for permission to discharge to the municipal sewer system may be required unless any subsurface structure of the building is designed as watertight or onsite disposal facilities are utilized.*

### 7.3 Permit to Take Water (PTTW)

As the calculated total construction dewatering flowrate for the building, including accumulated precipitation, is less than 50 m<sup>3</sup>/day, registration on the MECP Environmental Activity and Sector Registry (EASR) for Water Taking will not be required for construction. An application for permission to take water (PTTW) will not be required for neither construction dewatering nor permanent drainage as the daily flowrates are less than 400,000 L/day and 50,000 L/day respectively.

### 7.4 Groundwater Quality

One groundwater sample was collected from monitoring well MW5 and submitted to ALS laboratory for analyses of parameters under the Ontario Ottawa Sanitary and Storm Sewer By-Law No. 2003-514 (2003). The results of analyses for groundwater quality under the Ontario Ottawa Sanitary Sewer Bylaw and Storm Sewer By-Law No. 2003-514 (2003) show compliance with all parameters except as listed in Table 5.

**Table 5: Results from Sewer Use Bylaw tests**

Parameters	Guide Limits		Results
	Table 1 (Sanitary Sewer)	Table 2 (Storm Sewer)	MW4
Manganese (Mn)- Total mg/L	5	0.05	0.0959

Based on the results, presented in Table 5, pre-treatment of the groundwater will be required prior to discharging to the storm sewer system. The groundwater, in its present form, may be discharged to the sanitary sewer system without treatment.



It should be noted however that testing of groundwater at the depths observed during the investigation would not be representative of the water that might accumulate during a high rainfall event. Any accumulation of precipitation occurring in the excavation during construction, that may require offsite discharge, will have to be tested at the time of the event to determine the quality of water for discharge.

### **7.5 Dewatering Influence Zone**

The soils to the proposed excavation depths are dominated by clayey silt to silty clay. The estimated construction groundwater dewatering rate is based on worst-case groundwater conditions that might occur during the construction period. Estimated dewatering influence zones are less than 0.83m from the edge of the excavation area. As the dewatering quantity is relatively small and, based on the type of soils, construction dewatering may be handled by pumping from sump pits. Consequently, the dewatering influence zone will be negligible.

### **7.6 Hydrogeological Impact**

Based on the estimated dewatering influence zone of less than 1m it was determined that there will not be any negative impact to the natural environment, City of Ottawa Sewer works nor surrounding properties due to construction dewatering because of the relatively small quantity of water, type of soils and depths at which groundwater was encountered. No groundwater induced depression at surface level is expected. Consequently, it is not expected that construction dewatering will impact public infrastructure, the natural environment nor will there be any settlement issues.

### **7.7 Private Well Survey**

A query of the MECC water well records showed that there are approximately 33 well records within an approximate radius of 500m of the site as shown in Appendix H. Three (3) of these were listed as supply wells. The wells were installed mainly during the 1960's. Well depths vary from approximately 20.7m to 43.3m below prevailing grade. Static water levels were observed at depths of 5.8m to 20.7m with pump intake set at 7.6 to 12.2m bgs.

It is expected that newer developments in the area would be serviced by municipal water supply and that domestic water supply wells will not be widely used.

The type of material encountered at the expected excavation depths, below the surficial soils, are mainly clayey silt to clay/silty clay. Conventional pumping methods, pumping from sump pits is recommended



for the building with no underground levels. It is therefore not expected that construction dewatering will impact the quality and quantity of supply wells, if any, in proximity to the site.

## 8. INFILTRATION TESTS

Based on the field observation, the soils at the infiltration depth may be described as C.L (Inorganic clays of low to medium plasticity, silty clayey). For TH1 and TH2, grey, moist, soft silty clay was observed to depths of 1.98m below prevailing grade. This is consistent across the site, based on the subsurface investigation, and is underlain generally by grey, moist to wet, very soft clay. Coefficient of Permeability K values for C.L soils, based on the 'Supplementary Guidelines to the Ontario Building Code 1997, SB-6 Percolation Time and Soil Description', are approximately  $10^{-6}$  cm/s and less with Percolation Time T of over 50 mins/cm.

Field percolation tests were conducted on the site on October 6, 2022. Two test boreholes were drilled to approximate depth of 1.98m bgs and 100mm diameter pipes installed with slotted screen from the base of the test holes to five feet from the bottom. Well sand was placed at the bottom of the test holes to prevent scouring when water was poured.

Initial tests showed that an average of 1.1cm and 1.25cm of water seeped away in TH1 and TH2 respectively in 25 minutes. Pre-soaking of the soil was therefore carried out overnight (approximately 19 hours) and falling-head tests conducted on October 7, 2022. During pre-soaking, water levels fell approximately 34mm and 37mm over the 19-hour period in TH1 and TH2 respectively. Fresh potable water was added to the test holes and the fall in water levels monitored until the water level drop rates appeared to have stabilized.

Using the last three observed stable successive intervals, the percolation rate (Time T) was calculated as 50 min/cm and 33.33 min/cm in TH1 and TH2 respectively with corresponding infiltration rates, calculated as  $1/T$ , of 1.2 cm/h and 1.8 cm/h. Factored infiltration rate of 8 and 12 mm/h (FS of 1.5) should be used for planning purposes.

Based on a minimum percolation design criterion of  $4.17 \times 10^{-4}$  cm/sec (15 mm/h) as recommended by the Ontario MOE Stormwater Management Planning and Design Manual 2003 for infiltration trenches, it is not expected that the subject site would be suitable for the construction of infiltration facilities in the area of TH1 within the tested depth.



## 9. DISCUSSION/RECOMMENDATIONS

1. Hydraulic conductivity values (k) calculated from on-site single well response tests are in the range  $4.54 \times 10^{-8}$  to  $6.05 \times 10^{-7}$  m/s (0.004 to 0.052m/day) in the shallow monitoring wells. These are representative of the saturated subsoils dominated by silty clay to clay within the screened interval.
2. An average construction dewatering flowrate of 4.52 m<sup>3</sup>/day was estimated for approximate conventional footing elevation of 86.25m asl. A factor of safety of 1.5 should be applied to the construction dewatering rate.
3. Permanent drainage will not generally be required for the building with no underground level. It should be noted however that any below grade structure within 1m of the highwater level should be constructed with perimeter and under slab drainage unless designed as watertight.
4. Neither registration on the MECP's EASR Website for water taking nor an application for PTTW will be required under conditions observed on the site.
5. Based on the subsurface investigation, rising head slug tests and analyses and types of soils at the expected excavation depth, the groundwater discharge rate is not considered to be significant and may be handled by conventional pumping method via sump pits during construction.
6. The groundwater quality determined by laboratory analyses revealed exceedance(s) of storm guide limits and consequently pre-treatment of the water will be required before it can be discharged to the public storm sewer system.
7. It should be noted that if it is intended that any accumulated water, following periods of heavy rainfall, be discharged into the public sewer, then a permit to discharge would be required along with laboratory analyses to ensure compliance with the City of Ottawa Sewer Use Bylaws.
8. It is not expected that construction will impact the quality or quantity of supply wells, if any, in proximity to the site.
9. Based on field infiltration tests, infiltration-based LID measures may not be suitable for the site.
10. Dewatering rates for construction dewatering and permanent drainage presented in the preceding are based on common practice and reasonable assumptions for the underground level grade and are subject to revision should the subsurface portion of the building design changes.





## 10.LIMITATIONS

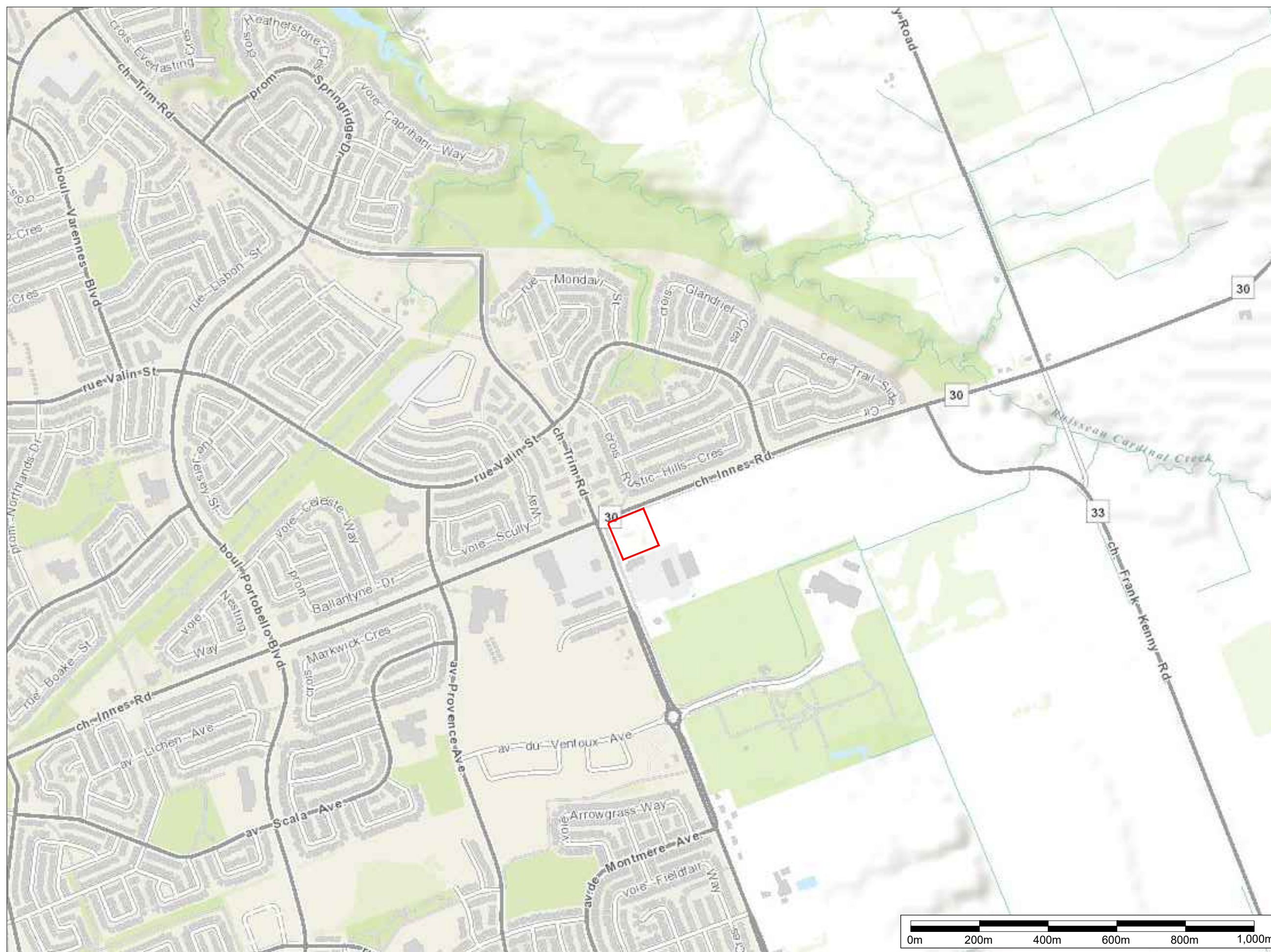
This report is limited in scope to those items specifically referenced in the text. The discussions and recommendations presented in this report are intended only as guidance for the named client, design engineers and those directly associated with implementing, regulating and monitoring of the project. The information on which these recommendations are based is subject to confirmation by engineering personnel at the time of construction. Localized variations in the subsoil conditions may be present between and beyond the boreholes and should be verified during construction.

As more specific subsurface information becomes available during excavations on the Site, this report should be updated. Contractors bidding on or undertaking the work should decide on their own investigations, as well as their own interpretations of the factual borehole results. This concern specifically applies to the classification of the subsurface soil and the potential reuse of these soils on/off Site. Contractors should draw their own conclusions as to how the near surface and subsurface conditions may affect them.

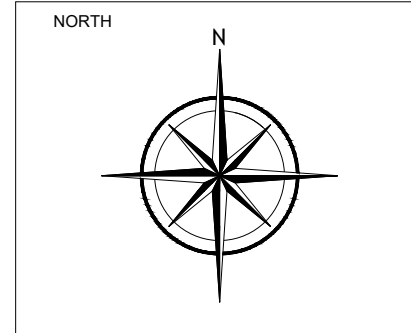


## **APPENDIX A – SITE AND LOCATION MAPS AND PLANS**





400 Esna Park Dr., #15  
 Markham, Ontario  
 L3R 3K2  
 Tel: 905 475-7755  
 Fax: 905 475-7718



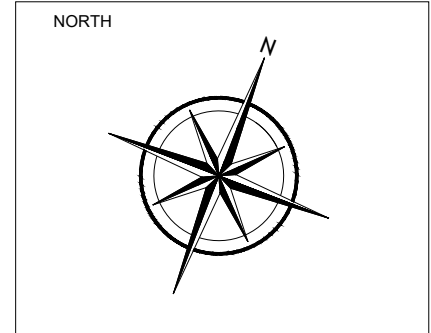
LEGEND

— SITE BOUNDARY

PROJECT NAME AND ADDRESS  
**GEOTECHNICAL &  
 HYDROGEOLOGICAL  
 INVESTIGATIONS**  
 5210 Innes Road,  
 Ottawa, ON

FIGURE A1:  
 SITE LOCATION PLAN

PROJECT NO. FE-P 22-12469/70	SHEET NO. <b>A1</b>
DATE 6 October 2022	
SCALE AS SHOWN	



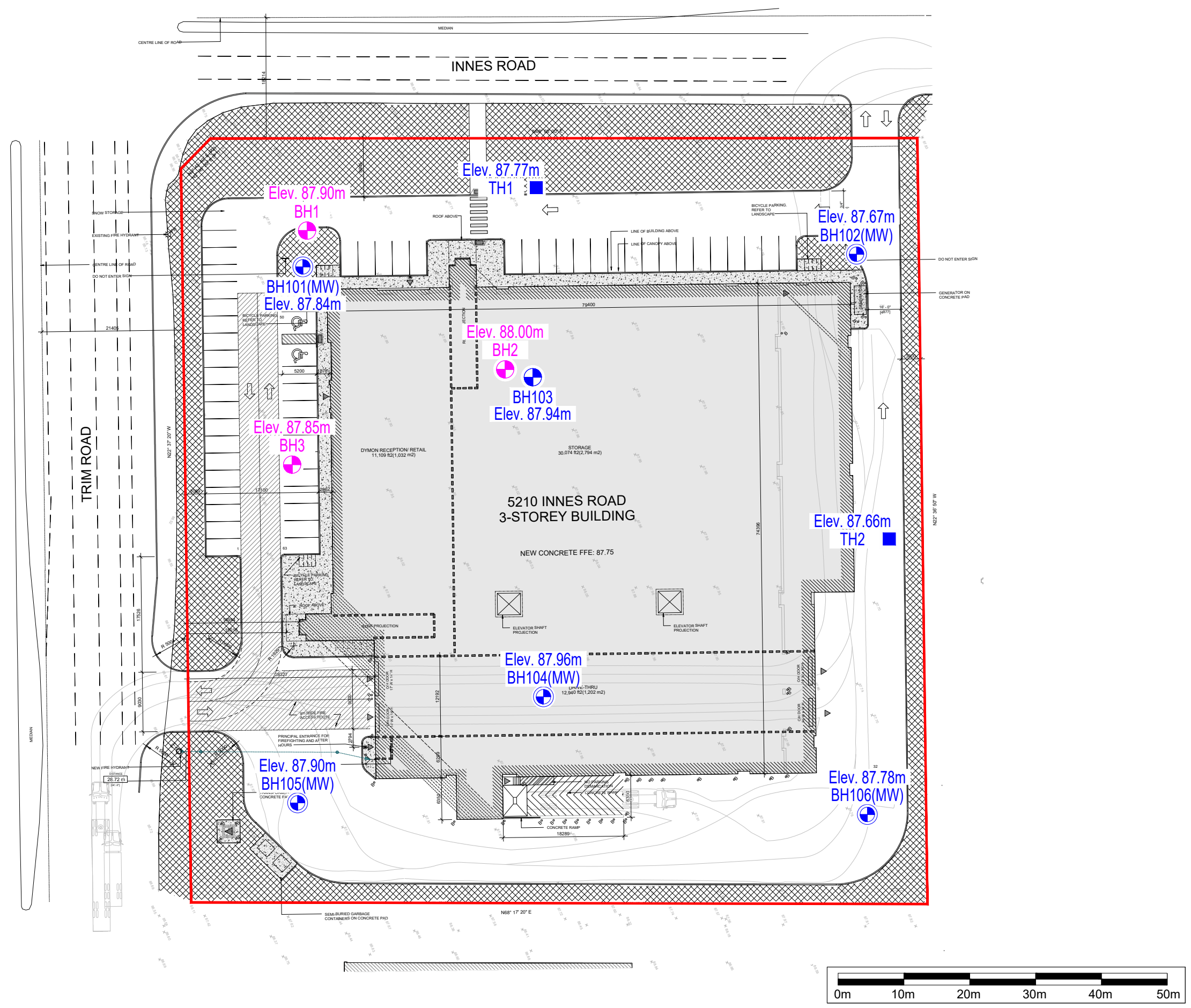
**LEGEND**

- SITE BOUNDARY
- EXISTING BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION
- TEST HOLE LOCATION

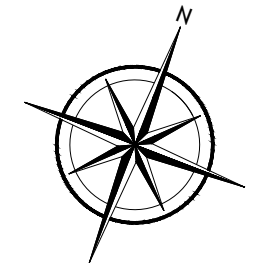
PROJECT NAME AND ADDRESS  
**GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS**  
 5210 Innes Road,  
 Ottawa, ON

FIGURE A2:  
**SITE PLAN WITH BOREHOLES / MONITORING WELL AND TEST HOLE LOCATIONS**

PROJECT NO. FE-P 22-12469/70	SHEET NO. <b>A2</b>
DATE 6 October 2022	
SCALE AS SHOWN	



NORTH



LEGEND

- SITE BOUNDARY
- EXISTING BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION
- TEST HOLE LOCATION
- CROSS SECTION MARK

PROJECT NAME AND ADDRESS

**GEOTECHNICAL &  
HYDROGEOLOGICAL  
INVESTIGATIONS**

5210 Innes Road,  
Ottawa, ON

FIGURE A3:

**SITE PLAN WITH BOREHOLES /  
MONITORING WELL AND  
TEST HOLE LOCATIONS**

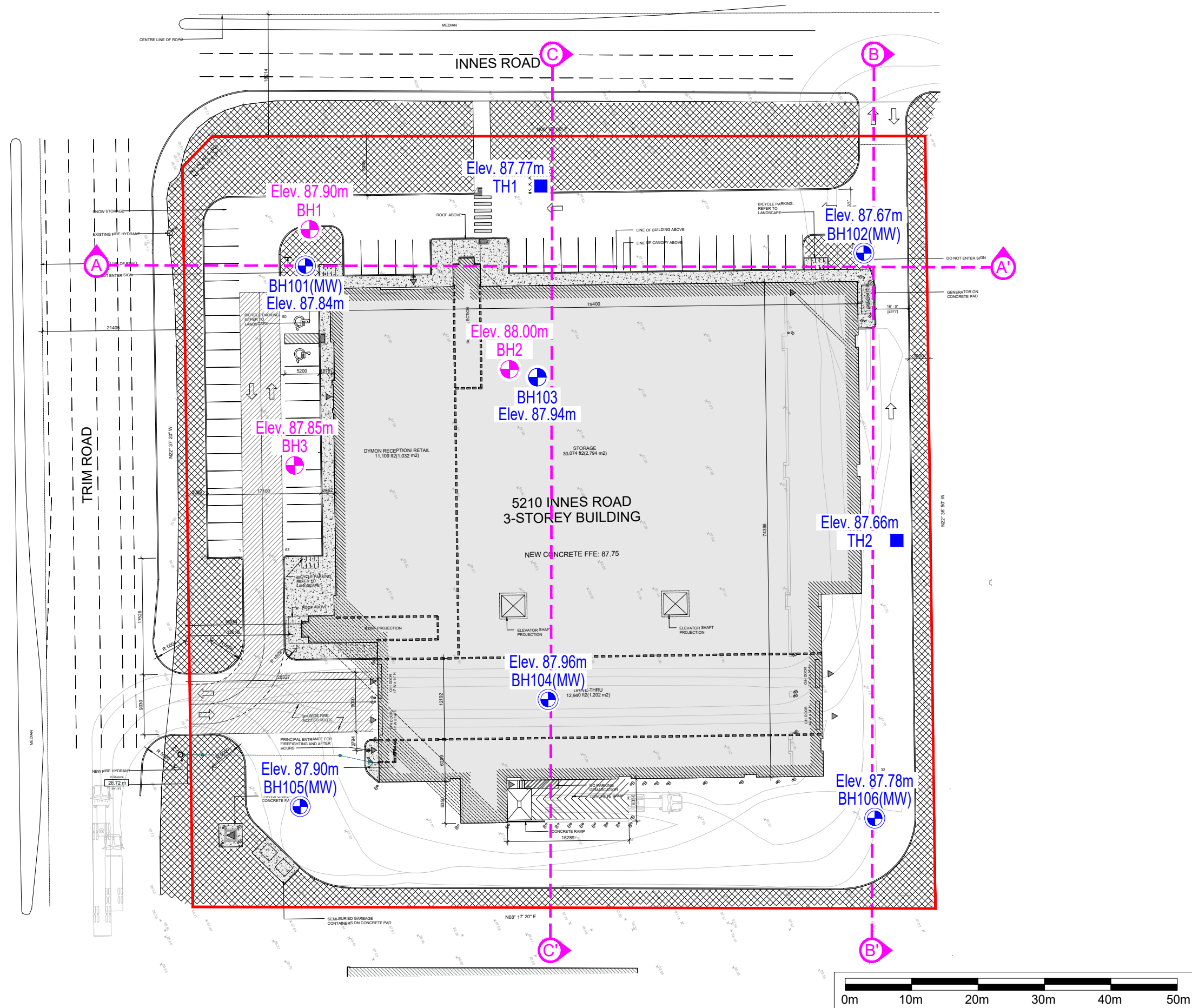
PROJECT NO.  
FE-P 22-12469/70

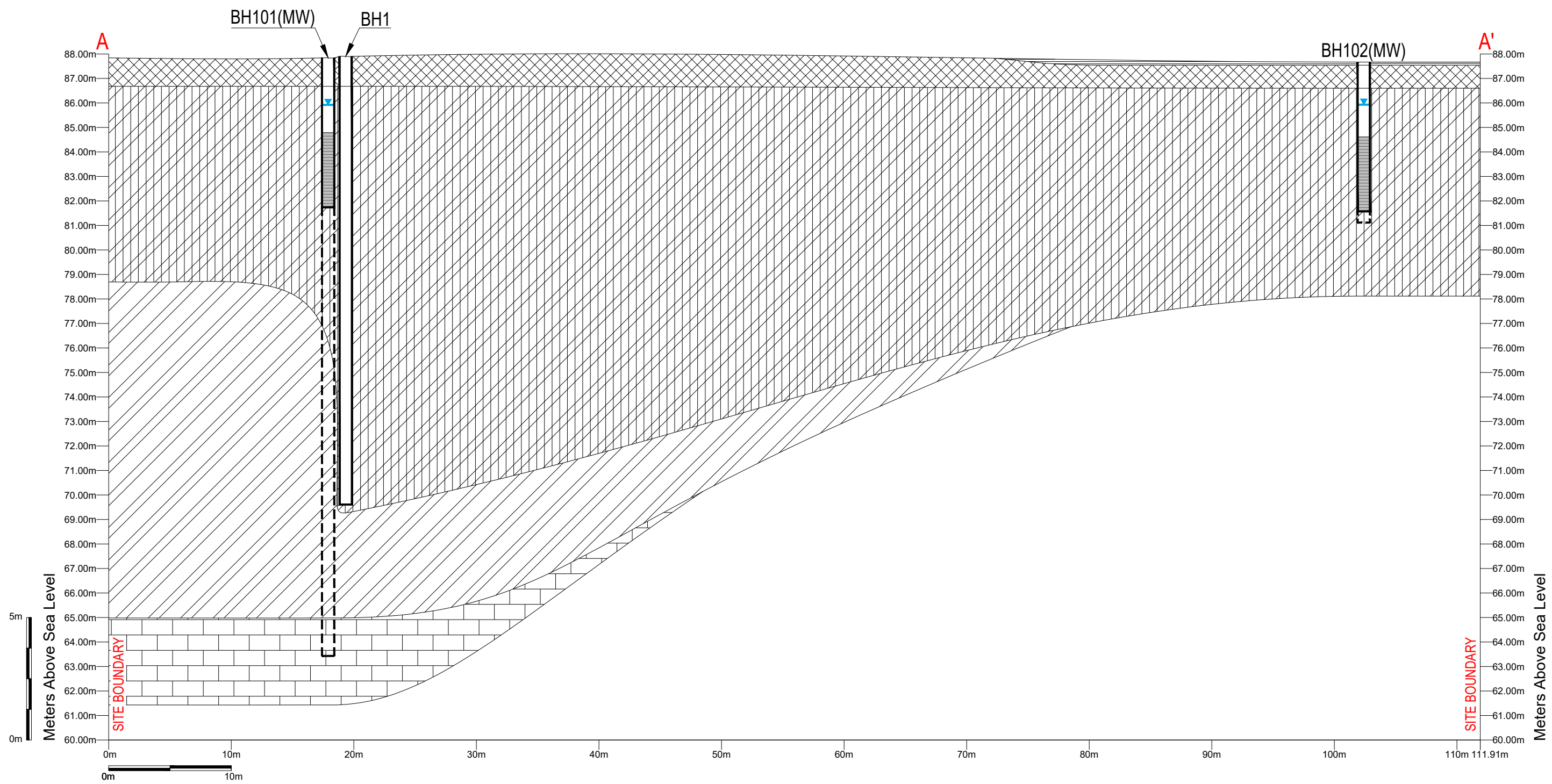
DATE  
6 October 2022

SCALE  
AS SHOWN

SHEET NO.

**A3**





400 Esna Park Dr., #15  
 Markham, Ontario  
 L3R 3K2  
 Tel: 905 475-7755  
 Fax: 905 475-7718

NORTH

LEGEND

- TOPSOIL
- FILL
- SILT
- CLAY
- CRUSHED ROCK
- GROUNDWATER POTENTIOMETRIC LEVEL

PROJECT NAME AND ADDRESS

**GEOTECHNICAL &  
 HYDROGEOLOGICAL  
 INVESTIGATIONS**

5210 Innes Road,  
 Ottawa, ON

PROJECT NO.

FE-P 22-12469/70

DATE.

6 October 2022

SCALE.

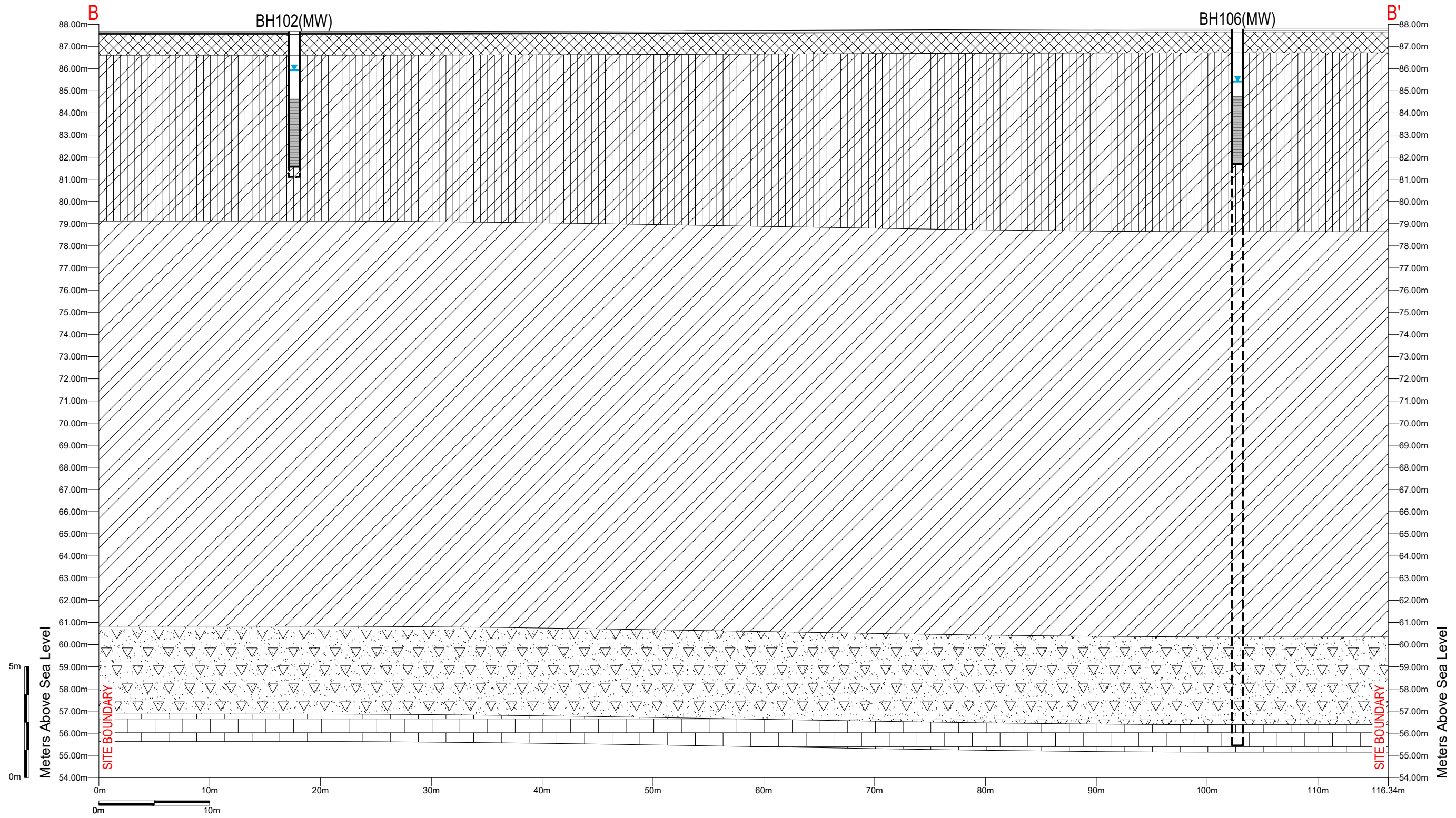
AS SHOWN

FIGURE A4.1:

**CROSS-SECTION A - A';**

SHEET NO.

**A4.1**



**FISHER ENGINEERING**

400 Esna Park Dr., #15  
Markham, Ontario  
L3R 3K2

Tel: 905 475-7755  
Fax: 905 475-7718

NORTH

**LEGEND**

	TOPSOIL		TOPSOIL
	SAND		SILT
	CLAY		GRAVEL
	CRUSHED ROCK		
	GROUNDWATER POTENTIOMETRIC LEVEL		

PROJECT NAME AND ADDRESS

**GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS**

5210 Innes Road,  
Ottawa, ON

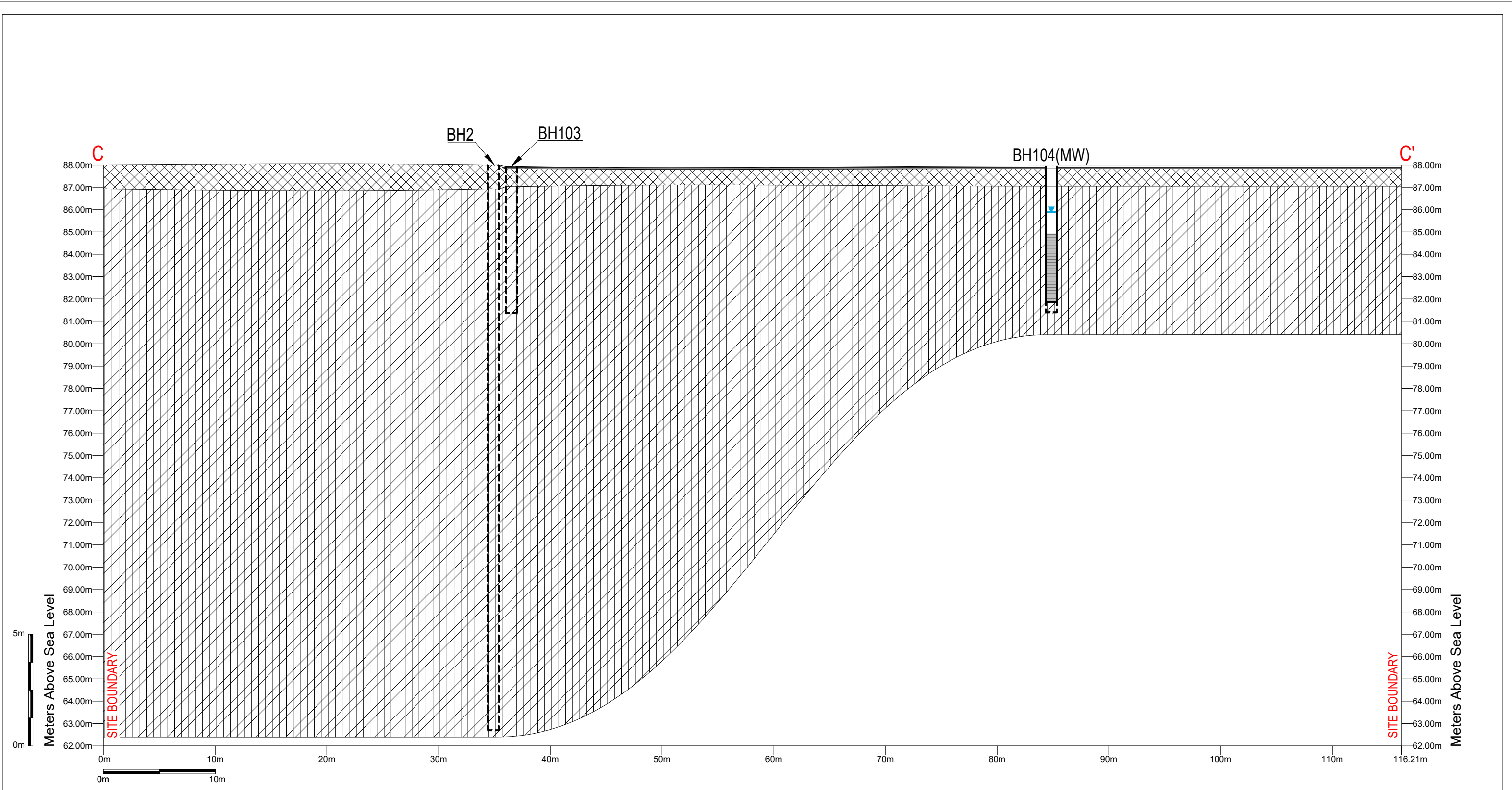
PROJECT NO.  
FE-P 22-12469/70

DATE.  
6 October 2022

SCALE.  
AS SHOWN

FIGURE A4.2:  
**CROSS-SECTION B - B';**





SHEET NO.  
**A4.2**



400 Esna Park Dr., #15  
 Markham, Ontario  
 L3R 3K2  
 Tel: 905 475-7755  
 Fax: 905 475-7718

NORTH

LEGEND

-  TOPSOIL
-  FILL
-  SILT
-  CLAY

 GROUNDWATER POTENTIOMETRIC LEVEL

PROJECT NAME AND ADDRESS

**GEOTECHNICAL &  
 HYDROGEOLOGICAL  
 INVESTIGATIONS**

5210 Innes Road,  
 Ottawa, ON

PROJECT NO.

FE-P 22-12469/70

DATE:

6 October 2022

SCALE:

AS SHOWN

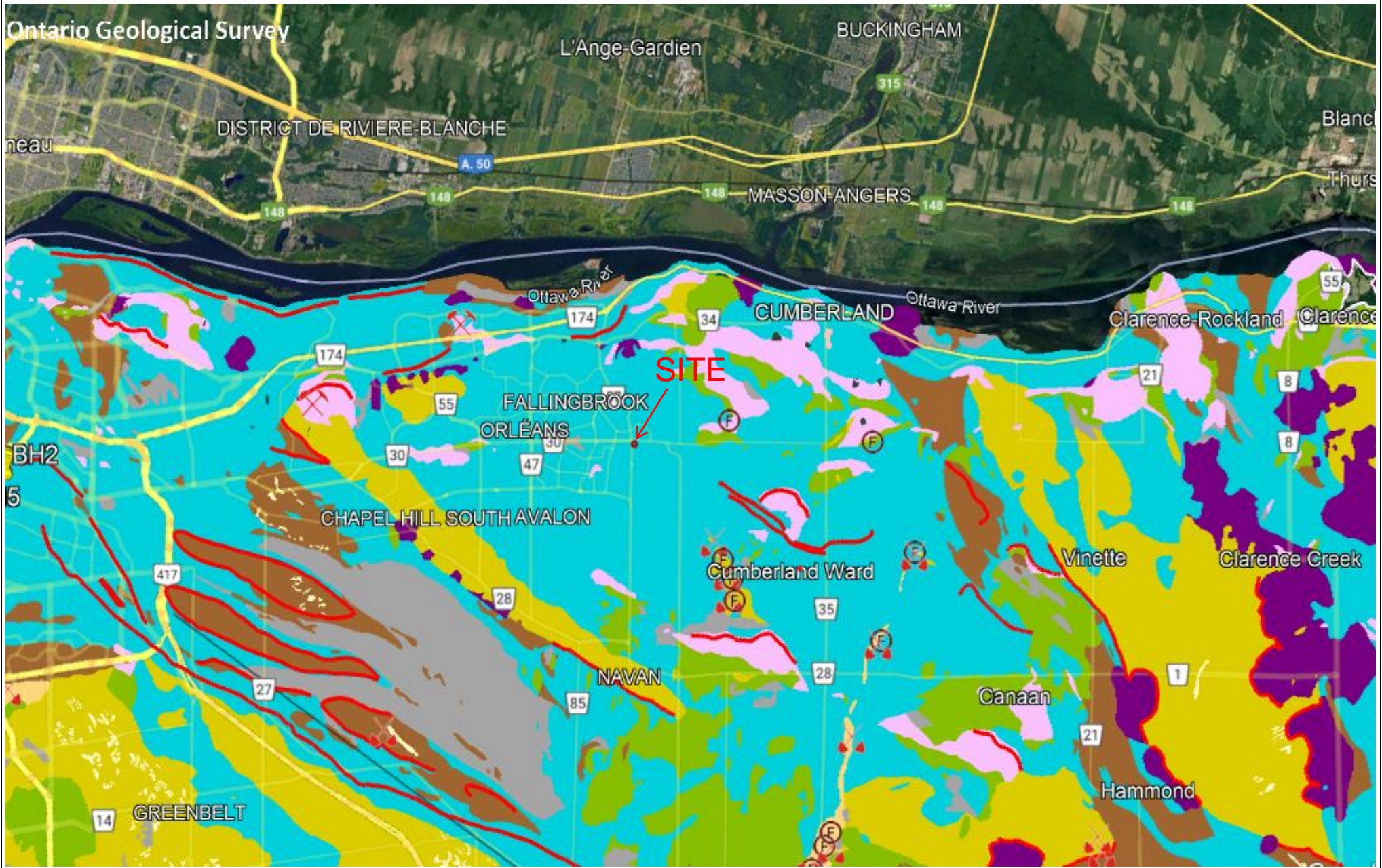
FIGURE A4.3:

**CROSS-SECTION C - C';**

SHEET NO.

**A4.3**





400 Esna Park Dr., #15  
 Markham, Ontario  
 L3R 3K2  
 Tel: 905 475-7755  
 Fax: 905 475-7718

KEY PLAN



LEGEND Fine-texture glaciomarine deposits of silt and clay,  
 minor sand and gravel: Massive to well laminated.



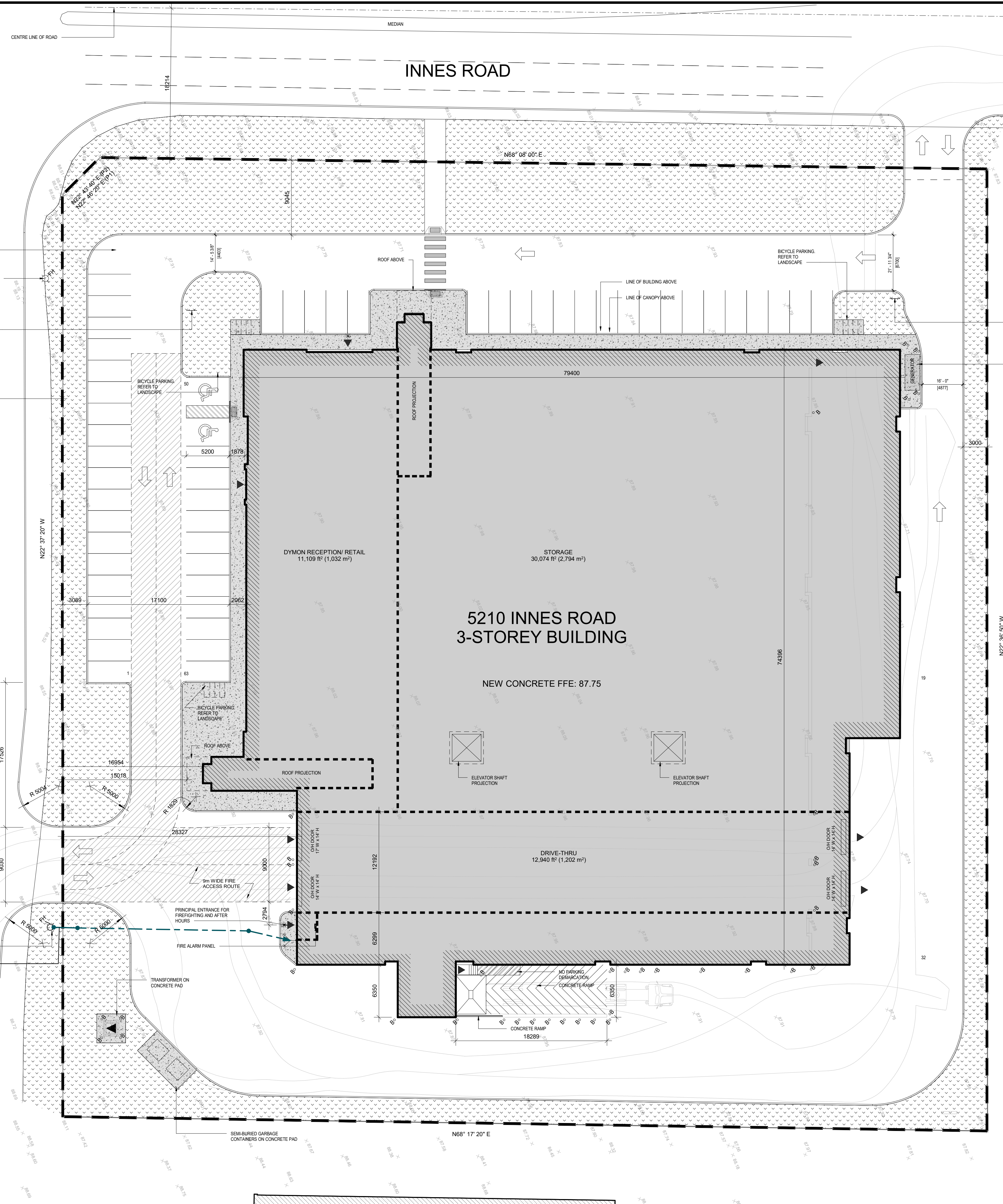
PROJECT NAME AND ADDRESS  
 HYDROGEOLOGICAL  
 INVESTIGATION  
 743 Warden Avenue,  
 TORONTO, ON

FE-P22-12484  
 PROJECT NO.

DATE  
 OCTOBER 2022

SCALE  
 As shown

FIGURE: A5  
 Surficial  
 Geology Map.



**LEGEND**

- PROPOSED BUILDING LOCATION
- EXISTING NEIGHBOURING BUILDING
- LANDSCAPED AREA
- CONCRETE/ SIDEWALK
- FIRE ROUTE
- BARRIER-FREE PARKING CLEARANCE
- TACTILE WALKING SURFACE INDICATOR
- FIRE DEPARTMENT CONNECTION
- ENTRANCE/ EXIT LOCATION
- PRINCIPAL ENTRANCE
- FIRE HYDRANT
- BOLLARD
- TRANSFORMER
- BARRIER-FREE PARKING
- VEHICULAR TRAFFIC DIRECTION
- CURB
- DEPRESSED CURB
- TYPICAL BIKE RACK
- TYPICAL PARKING
- TYPICAL QUEUING SPACE
- TYPICAL BF PARKING

**GENERAL SITE PLAN NOTES:**

**TOPOGRAPHICAL INFORMATION:**  
PART OF LOT 1 CONCESSION 8 GEOGRAPHIC TOWNSHIP OF CUMBERLAND CITY OF OTTAWA

**SURVEY BY:**

**SITE AND BUILDING DATA:**

SITE AREA	12,986 m <sup>2</sup>
NEW BUILDING AREA	5,666 m <sup>2</sup>
NEW BUILDING HEIGHT	-----
GROSS BUILDING AREA <sup>1</sup>	17,012 m <sup>2</sup>
GROSS BUILDING AREA <sup>2</sup>	17,012 m <sup>2</sup>

**GENERAL NOTES:**

- FOR PAVED SURFACES, GRADING, SITE SERVICING, DRAINAGE EROSION AND SEDIMENT CONTROL, REFER TO CIVIL DRAWINGS.
- FOR PLANTING DETAILS, REFER TO LANDSCAPE DRAWINGS.

**GROSS BUILDING AREA:**

- (ONTARIO BUILDING CODE DEFINITION): THE TOTAL AREA OF ALL FLOORS ABOVE GRADE MEASURED BETWEEN THE OUTSIDE SURFACES OF EXTERIOR WALLS.
- GROSS FLOOR AREA (CITY OF OTTAWA ZONING BYLAW DEFINITION FOR THE PURPOSE OF DETERMINING PARKING REQUIREMENTS): GROSS LEASABLE FLOOR AREA MEANS THE TOTAL FLOOR AREA DESIGNED FOR TENANT OCCUPANCY AND EXCLUSIVE USE, MEASURED FROM THE INTERIORS OF OUTSIDE WALLS EXCLUDING FLOOR AREA OCCUPIED BY PARTY WALLS AND EXCLUDING:
- FLOOR AREA OCCUPIED BY SHARED MECHANICAL, SERVICE AND ELECTRICAL EQUIPMENT THAT SERVE THE BUILDING, (BY-LAW 2008-326)
- COMMON HALLWAYS, CORRIDORS, STAIRWELLS, ELEVATOR SHAFTS AND OTHER VOIDS, STEPS AND LANDINGS, (BY-LAW 2008-326)
- BICYCLE PARKING; MOTOR VEHICLE PARKING OR LOADING FACILITIES; COMMON LAUNDRY, STORAGE AND WASHROOM FACILITIES THAT SERVE THE BUILDING OR TENANTS.
- COMMON STORAGE AREAS THAT ARE ACCESSORY TO THE PRINCIPAL USE OF THE BUILDING, (BY-LAW 2008-326)
- COMMON AMENITY AREA AND PLAY AREAS ACCESSORY TO A PRINCIPLE USE ON THE LOT, AND (BY-LAW 2008-326) LIVING QUARTERS FOR A CARETAKER OF THE BUILDING.

**ZONING:**

ZONING DESIGNATIONS (PART 10):  
RC[36] - LIGHT COMMERCIAL ZONE

**ZONING PROVISIONS**

MINIMUM LOT WIDTH (m):	30 m
MINIMUM LOT AREA (m <sup>2</sup> ):	4,000 m <sup>2</sup>
MINIMUM FRONT YARD SETBACK:	10 m
MINIMUM REAR YARD SETBACK:	10 m
MINIMUM INTERIOR SIDE YARD SETBACK:	3 m
MINIMUM CORNER SIDE YARD SETBACK:	6 m

**BUILDING HEIGHT**

MAXIMUM (WITHIN 12 m OF R1, R2, R3 ZONES): 11 m PROPOSED:

**LANDSCAPING (SECTION 110):**

REQUIRED FRONT AND CORNER SIDE YARDS TO BE LANDSCAPED, EXCEPT FOR DRIVEWAYS CROSSING THE FRONT OR CORNER SIDE YARD LEADING TO PARKING AREA

**VEHICLE PARKING (SECTION 101):**

WAREHOUSE (0.8/100M) FIRST 5000m:	(5,000/100m <sup>2</sup> ) x 0.8 = xx
WAREHOUSE (0.4/100M) AFTER 5000m:	(13,910.60/100m <sup>2</sup> ) x 0.4 = xx

**PARKING FOR THE PHYSICALLY DISABLED (PARKING BYLAW 2003-530, SECTION 122):**

MINIMUM REQUIRED:	1
NUMBER PROVIDED:	1 TYPE 'A' 0 TYPE 'B'

**PARKING SUMMARY**

Type	Count
PARK-5.2X2.6	52
PARK-BF-5.2X3.4	2
Grand total	54

**BICYCLE PARKING (SECTION 111):**

MINIMUM REQUIRED:	10
NUMBER PROVIDED:	12

**LOADING ZONE (SECTION 113):**

MINIMUM REQUIRED:	
NUMBER PROVIDED:	

**GENERAL NOTES**

- DO NOT SCALE DRAWINGS; ONLY FIGURED DIMENSIONS ARE TO BE USED, WHERE DOUBT EXISTS; FILE REQUEST FOR INTERPRETATION AND REQUEST CLARITY.
- IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO VERIFY DIMENSIONS ON SITE; REPORT DISCREPANCIES TO THE ARCHITECT PROMPTLY.
- GENERAL CONTRACTOR TO TAKE INTO ACCOUNT CONSTRUCTION TOLERANCE; GENERAL CONTRACTOR TO COORDINATE THE WORK OF DIFFERENT TRADES TO COMPLY WITH DESIGN INTENT.
- ALL WORK DESCRIBED IN THESE DRAWINGS AND SPECIFICATIONS ARE TO COMPLY WITH THE CURRENT EDITION OF THE ONTARIO BUILDING CODE (2010) INCLUDING MOST RECENT AMENDMENTS.
- DRAWINGS AND SPECIFICATIONS ARE COMPLEMENTARY AND ARE TO BE READ TOGETHER.

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**ISSUE RECORD**

NO.	DESCRIPTION	DATE
1	ISSUE FOR REVIEW	2022-05-19
2	ISSUE FOR REVIEW	2022-07-13

**CLIENT**

**DYMON SELF-STORAGE**  
2-1830 WALKLEY ROAD, OTTAWA, ON  
(T) 613-247-0888

**CONSULTANTS**

**FOTENN PLANNING + DESIGN**  
223 MCLEOD STREET, OTTAWA ON  
PLANNING & URBAN DESIGN  
(T) 613-730-5709

**D B GRAY ENGINEERING INC.**  
700 LONG POINT CIR, GLOUCESTER, ON.  
CIVIL ENGINEER  
(T) 613-425-8044

**TACT ARCHITECTURE INC.**  
660R COLLEGE STREET (REAR LANE) TORONTO ON.  
DESIGN ARCHITECT  
(T) 416-516-1949

**BRUMER ENGINEERING SERVICES LTD**  
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MECHANICAL CONSULTANTS  
(T) 905-771-7798

**HUDSON ENGINEERING**  
2901 STEELES AVE W UNIT 26, TORONTO, ON  
ELECTRICAL CONSULTANTS  
(T) 416-663-5470

**D+M STRUCTURAL LTD.**  
110-333 PRESTON ST. OTTAWA, ON  
STRUCTURAL CONSULTANTS  
(T) 613 651-9490

**4 3RD-FLR**  
SCALE: 1:1000

**3 2ND-FLR**  
SCALE: 1:1000

**2 G-FLR**  
SCALE: 1:1000

**AREA BY LEVEL**

Name	Area	SF
L1-DRIVE-AISLE	862.88 m <sup>2</sup>	9287.98 ft <sup>2</sup>
L1-RECEPTION	11,243 m <sup>2</sup>	12103.28 ft <sup>2</sup>
L1-STORAGE	3296.45 m <sup>2</sup>	35482.72 ft <sup>2</sup>
L2-STORAGE	5666.08 m <sup>2</sup>	60989.15 ft <sup>2</sup>
L3-STORAGE	5666.08 m <sup>2</sup>	60989.15 ft <sup>2</sup>

**GROSS AREA**

SM	SF
17003.09 m <sup>2</sup>	183019.71 ft <sup>2</sup>

**1 SITE PLAN**  
SCALE: 1:250

**DCA**

**A GROUP OF ARCHITECTS**  
201-1339 WELLINGTON ST. W. OTTAWA ON K1Y 3B8  
WWW.ARCHITECTSDCA.COM 613.725.2294

**PROJECT TITLE**  
DYMON 5210 INNES ROAD

**DRAWING TITLE**  
SITE PLAN

DATE	DRAWN	JOB NO.	DRAWING NO.
APRIL 2022	SD	3465	A001
SCALE	REVIEWED		
As indicated	TD		

**ARCHITECTURAL**

TOPOGRAPHICAL PLAN OF  
**PART OF LOT 1  
 CONCESSION 8  
 GEOGRAPHIC TOWNSHIP OF CUMBERLAND  
 CITY OF OTTAWA**  
 Surveyed by Annis, O'Sullivan, Vollebakk Ltd.

Scale 1 : 250  
 10 7.5 5.0 2.5 0 5 10 Metres

Metric  
 DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND  
 CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

Nov. 10, 2021  
 Date E.H. Herweyer O.L.S.

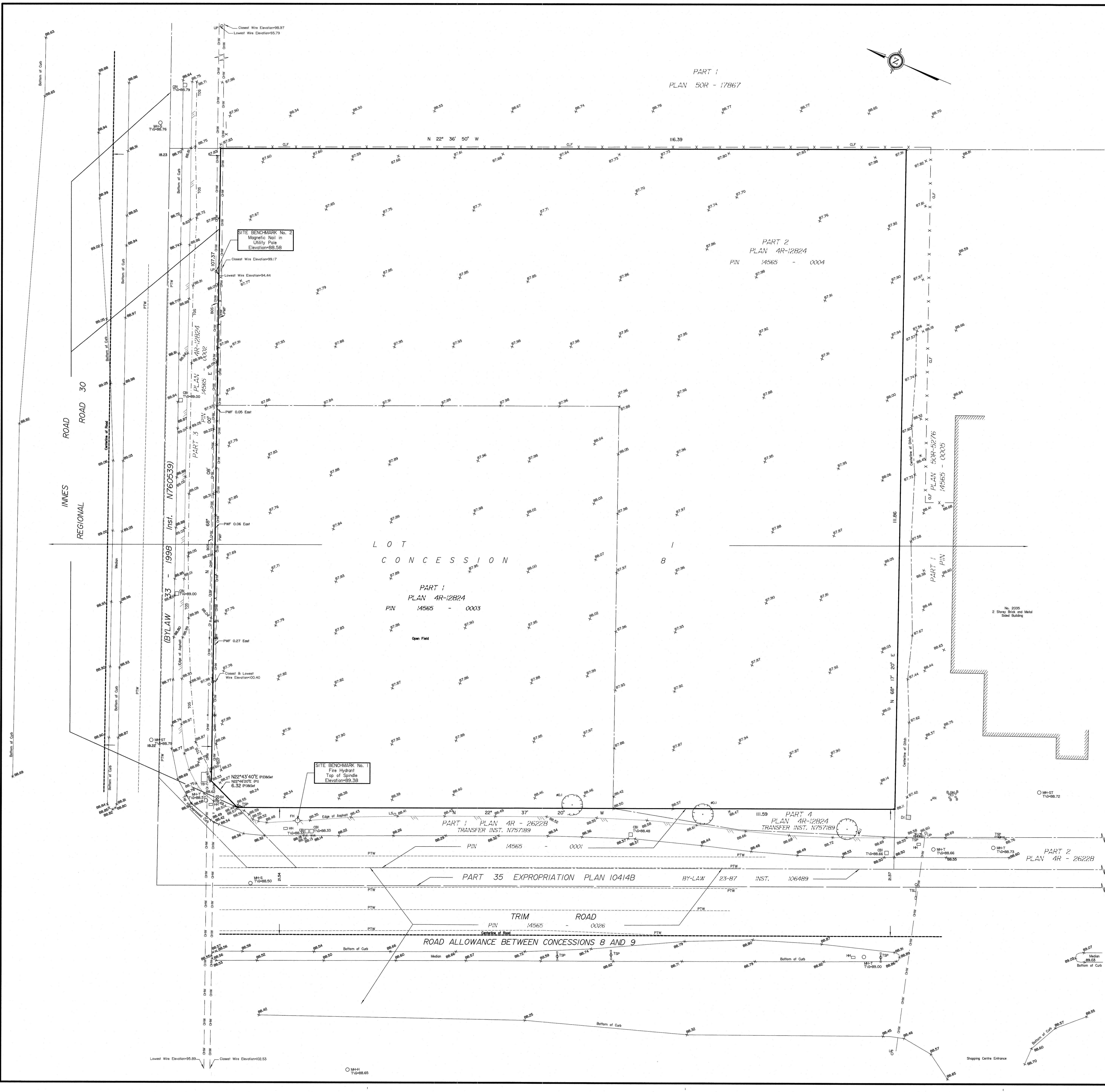
SITE AREA = 12992 m<sup>2</sup>

Bearings are grid, derived from Can-Net 2016 Real Time Network GPS and are referenced to Specified Control Points 01919880184 and 019198434761, MTM Zone 9 (76°30' West Longitude) NAD-83 (original).  
 For bearing comparisons, a rotation of 0°43'10" counter-clockwise was applied to bearings on plan P1.










**ELEVATION NOTES**  
 1. Elevations shown are geodetic and are referred to benchmark 001196530190 having an elevation of 59.11m.  
 2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that its relative elevation and description agrees with the information shown on this drawing.

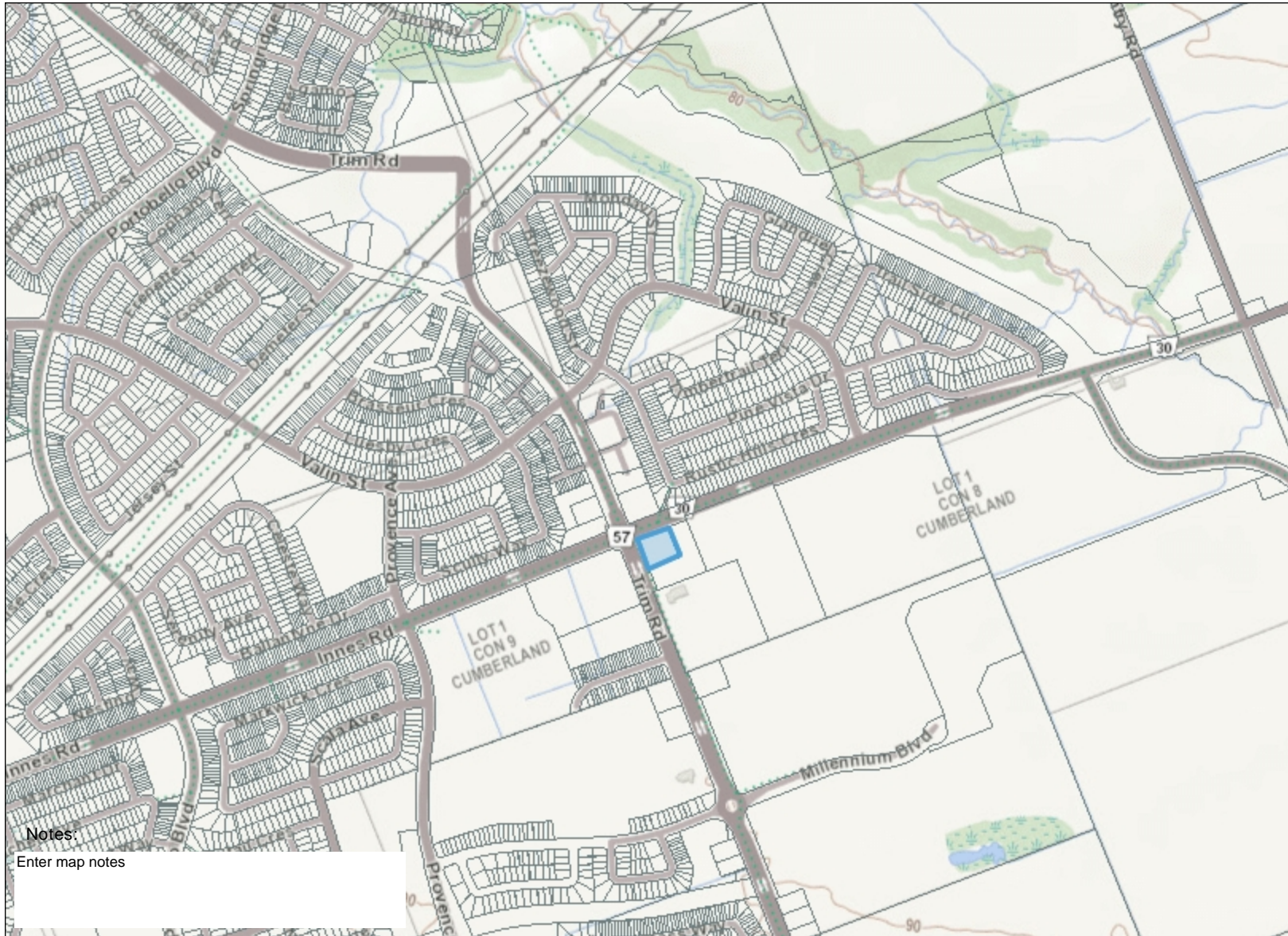
**Notes & Legend**

- |         |                                   |                         |
|---------|-----------------------------------|-------------------------|
| □       | Denotes                           | Survey Monument Planted |
| ■       | Survey Monument Found             |                         |
| SSIB    | Short Standard Iron Bar           |                         |
| IB      | Iron Bar                          |                         |
| (WIT)   | Witness                           |                         |
| Meas.   | Measured                          |                         |
| (AOG)   | Annis, O'Sullivan, Vollebakk Ltd. |                         |
| (P1)    | Plan 4R-12824                     |                         |
| (P2)    | Plan 4R-26228                     |                         |
| ○ FH    | Fire Hydrant                      |                         |
| ○ MH-ST | Maintenance Hole (Storm Sewer)    |                         |
| ○ MH-S  | Maintenance Hole (Sanitary)       |                         |
| ○ MH-T  | Maintenance Hole (Traffic)        |                         |
| ○ GV    | Gas Valve                         |                         |
| □ HH    | Handhole                          |                         |
| □ TB-C  | Cable Terminal Box                |                         |
| PWF     | Post and Wire Fence               |                         |
| PTW     | White Paint Lines                 |                         |
| ○ UP    | Utility Pole                      |                         |
| AN      | Anchor                            |                         |
| LS      | Light Standard                    |                         |
| CB      | Catch Basin                       |                         |
| CB      | Catch Basin Inlet                 |                         |
| OW      | Overhead Wires                    |                         |
| BOS     | Bottom of Slope                   |                         |
| TOS     | Top of Slope                      |                         |
| ∅       | Diameter                          |                         |
| 45.00   | Location of Elevations            |                         |
| 55.00   | Top of Concrete Curb Elevation    |                         |
| C/L     | Centreline                        |                         |
| ○       | Deciduous Tree                    |                         |
| □ GM    | Gas Meter                         |                         |
| ○ TSP   | Traffic Signal Post               |                         |
| CLF     | Chain Link Fence                  |                         |
| ○ TSL   | Traffic Light                     |                         |



Legend

-  Assessment Parcel
-  ANSI
-  Earth Science Provincially Significant/sciences de la terre d'importance provinciale
-  Earth Science Regionally Significant/sciences de la terre d'importance régionale
-  Life Science Provincially Significant/sciences de la vie d'importance provinciale
-  Life Science Regionally Significant/sciences de la vie d'importance régionale
-  Conservation Reserve
-  Provincial Park
-  Natural Heritage System



Notes:

Enter map notes



Absence of a feature in the map does not mean they do not exist in this area.

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Natural Resources and Forestry(OMNRF) shall not be liable in any way for the use of, or reliance upon, this map or any information on this map.

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## **APPENDIX B – LOG OF BOREHOLES**

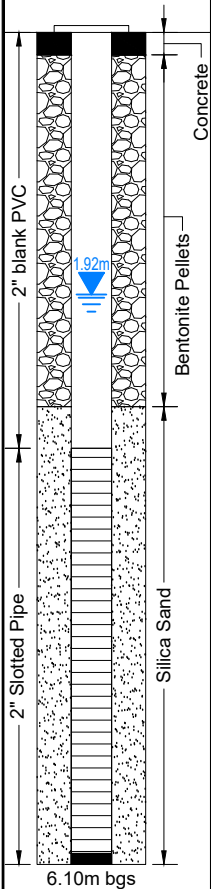


PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 5210 Innes Road, Ottawa, ON

DRILLING METHOD: Truck, Mud Rotary

DRILLING DATE: 21 September, 2022

DEPTH (feet) DEPTH (meters)	SOIL PROFILE		SAMPLES			PENETRATION TESTING (SPT) ▲				VAPOUR READING (ppm) □				PIEZOMETER OR WELL CONSTRUCTION	
	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE	SHEAR STRENGTH (Kpa) ✚				MOISTURE CONTENT (%) ●				
							20	40	60	80	20	40	60		80
0	Augered to 9.14m		87.84												
2															
4															
6															
8															
10															
12															
14															
16															
18															
20															
22															
24															
26															
28															
30			9.14 / 78.70												
32	CLAY: Grey, wet, very soft				SS-1	0									
34															

Groundwater Depth (m): on completion: N/A, Mud Rotary; on 6 October 2022: 1.92m

DRAWN: D.C.

LOGGED: J.Y.

CHECKED: C.W.



LOG OF BOREHOLE

NO. BH101(MW) SHEET. 2 of 3

PROJECT NO.: FE-P# 22-12469/70

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 5210 Innes Road, Ottawa, ON

DRILLING METHOD: Truck, Mud Rotary

DRILLING DATE: 21 September, 2022

DEPTH (feet) DEPTH (meters)	SOIL PROFILE		SAMPLES			PENETRATION TESTING (SPT) ▲				VAPOUR READING (ppm) □				PIEZOMETER OR WELL CONSTRUCTION							
	DESCRIPTION	STRATA PLOT	LAB ID	Type NO.	"N" VALUE	SHEAR STRENGTH (Kpa) ⊕				MOISTURE CONTENT (%) ●											
						20	40	60	80	20	40	60	80		10	20	30	40			
36 11	CLAY: Grey, wet, very soft																				
38																					
40 12																					
42																					
44																					
46																					
48																					
50																					
52 16																					
54																					
56																					
58																					
60 18																					
62 19	CLAY: Grey, layers of gravelly sand, pieces of crushed rock, very moist to wet, very stiff/compact																				
64																					
66																					
68																					
70 21																					

Groundwater Depth (m): on completion: N/A, Mud Rotary, on 6 October 2022: 1.92m

DRAWN: D.C. | LOGGED: J.Y. | CHECKED: C.W.



# LOG OF BOREHOLE

NO. BH101(MW) SHEET. 3 of 3

PROJECT NO.: FE-P# 22-12469/70

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 5210 Innes Road, Ottawa, ON

DRILLING METHOD: Truck, Mud Rotary

DRILLING DATE: 21 September, 2022

DEPTH (feet) (meters)	SOIL PROFILE		SAMPLES			PENETRATION TESTING (SPT) ▲				VAPOUR READING (ppm) □				PIEZOMETER OR WELL CONSTRUCTION
	DESCRIPTION	STRATA PLOT	LAB ID	Type NO.	"N" VALUE	SHEAR STRENGTH (Kpa) ✚				MOISTURE CONTENT (%) ●				
						20	40	60	80	10	20	30	40	
70														
72				SS-5	26									
74														
76	23 CRUSHED ROCK: Grey, some silt/clay, wet, very dense													
78														
80	24 Auger refusal @ 24.41m probably due to chunk/piece of rock End of borehole at 24.41m			SS-6	100+									
82														
84														
86														
88														
90														
92														
94														
96														
98														
100														
102														
104														

Groundwater Depth (m): on completion: N/A, Mud Rotary, on 6 October 2022: 1.92m

DRAWN: D.C. | LOGGED: J.Y. | CHECKED: C.W.

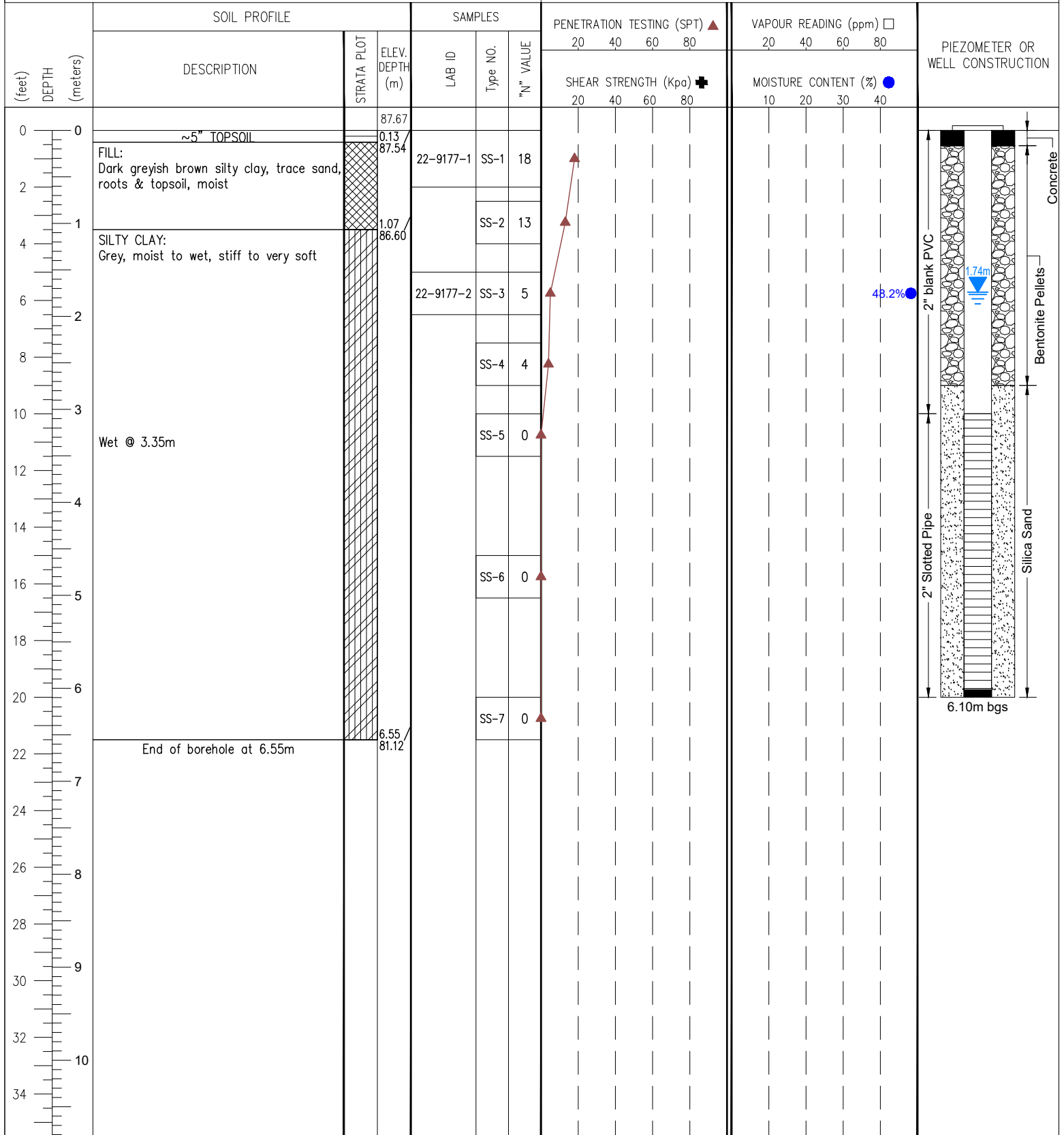


PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 5210 Innes Road, Ottawa, ON

DRILLING METHOD: Truck, Solid Stem

DRILLING DATE: 22 September, 2022



Groundwater Depth (m): on completion: Dry; on 6 October 2022: 1.74m

DRAWN: D.C.

LOGGED: J.Y.

CHECKED: C.W.



# LOG OF BOREHOLE

NO. BH103 SHEET. 1 of 1

PROJECT NO.: FE-P# 22-12469/70

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 5210 Innes Road, Ottawa, ON

DRILLING METHOD: Truck, Solid Stem

DRILLING DATE: 20 September, 2022

DEPTH (feet) DEPTH (meters)	SOIL PROFILE		SAMPLES			PENETRATION TESTING (SPT) ▲				VAPOUR READING (ppm) □				PIEZOMETER OR WELL CONSTRUCTION
	DESCRIPTION	STRATA PLOT	LAB ID	Type NO.	"N" VALUE	20 40 60 80				20 40 60 80				
						SHEAR STRENGTH (Kpa) ➕				MOISTURE CONTENT (%) ●				
0	~4" TOPSOIL													
0	FILL: Dark grey silty clay, trace sand, roots, topsoil & topsoil mixed soils, moist		22-9177-3	SS-1	8									
1	SILTY CLAY: Greenish grey, moist, stiff to very soft			SS-2	13									
2			22-9177-4	SS-3	6							45.8%		
3				SS-4	2									
4	SILTY CLAY: Grey, moist to wet, very soft			SS-5	2									
5	Wet @ 4.57m			SS-6	0									
6				SS-7	0									
7	End of borehole at 6.55m													

Groundwater Depth (m): on completion: 3.55m

DRAWN: D.C.

LOGGED: J.Y.

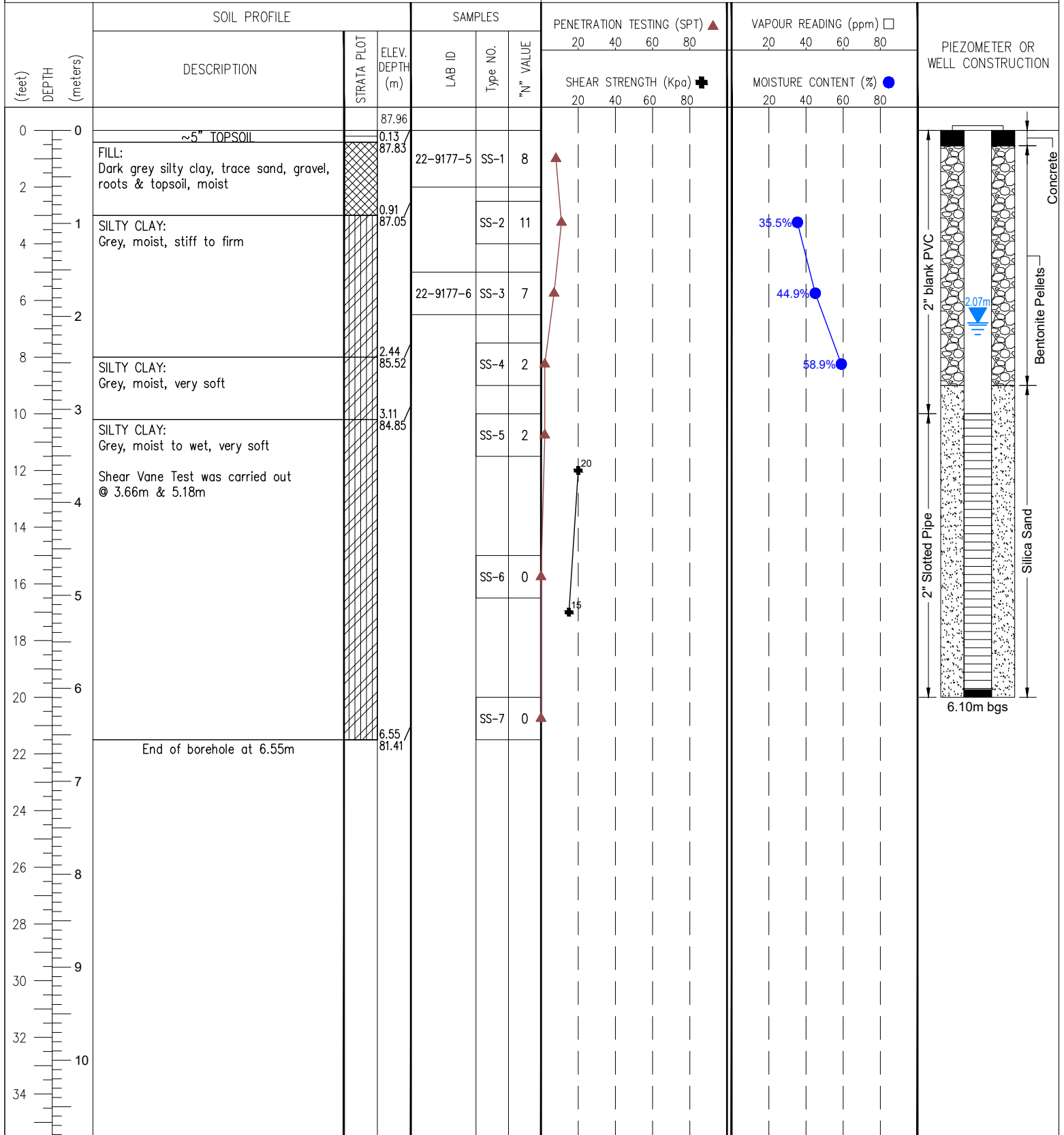
CHECKED: C.W.

PROJECT NAME: GEOTECHNICAL &amp; HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 5210 Innes Road, Ottawa, ON

DRILLING METHOD: Truck, Solid Stem

DRILLING DATE: 20 September, 2022



Groundwater Depth (m): on completion: 4.88m; on 6 October 2022: 2.07m

DRAWN: D.C.

LOGGED: J.Y.

CHECKED: C.W.

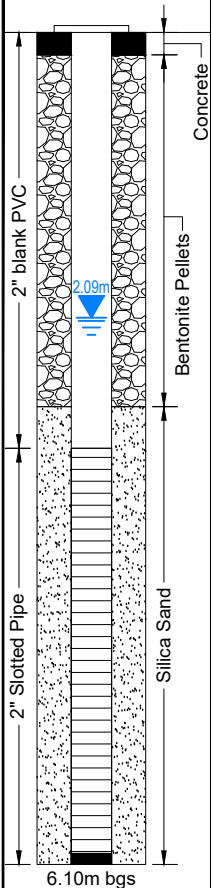
PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 5210 Innes Road, Ottawa, ON

DRILLING METHOD: Truck, Solid Stem

DRILLING DATE: 20 September, 2022

DEPTH (feet) DEPTH (meters)	SOIL PROFILE		SAMPLES			PENETRATION TESTING (SPT) ▲				VAPOUR READING (ppm) □				PIEZOMETER OR WELL CONSTRUCTION	
	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE	SHEAR STRENGTH (Kpa) ✚				MOISTURE CONTENT (%) ●				
							20	40	60	80	20	40	60		80
0	~4" TOPSOIL		87.90												
0.10	FILL: Dark grey to reddish brown silty clay, trace sand & roots, moist		87.80	22-9177-7	SS-1	11									
0.69	SILTY CLAY: Grey, moist, stiff		87.21		SS-2	14									
2.44			85.46	22-9177-8	SS-3	10									
3.14	SILTY CLAY: Grey, moist, firm		84.76		SS-4	6									
6.55	CLAY: Grey, moist, very soft		81.35		SS-5	0									
6.55	End of borehole at 6.55m		81.35		SS-6	0									
					SS-7	0									



Groundwater Depth (m): on completion: Dry, on 6 October 2022: 2.09m

DRAWN: D.C.

LOGGED: J.Y.

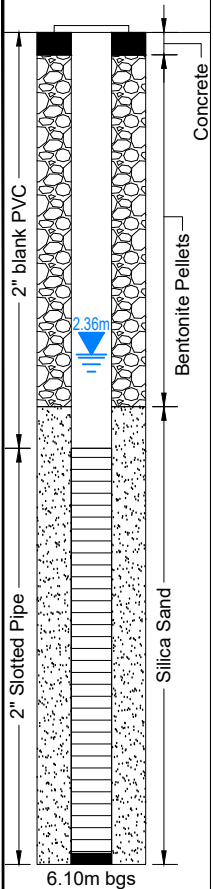
CHECKED: C.W.

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 5210 Innes Road, Ottawa, ON

DRILLING METHOD: Truck, Mud Rotary

DRILLING DATE: 22 September, 2022

DEPTH (feet) DEPTH (meters)	SOIL PROFILE		SAMPLES			PENETRATION TESTING (SPT) ▲				VAPOUR READING (ppm) □				PIEZOMETER OR WELL CONSTRUCTION	
	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE	SHEAR STRENGTH (Kpa) +				MOISTURE CONTENT (%) ●				
							20	40	60	80	20	40	60		80
0	Augered to 9.14m		87.78												
2															
4															
6															
8															
10															
12															
14															
16															
18															
20															
22															
24															
26															
28															
30			9.14 78.64												
32	CLAY: Grey, wet, very soft			SS-1		0									
34															

Groundwater Depth (m): on completion: N/A, Mud Rotary, on 6 October 2022: 2.36m

DRAWN: D.C.

LOGGED: J.Y.

CHECKED: C.W.



# LOG OF BOREHOLE

NO. BH106(MW) SHEET. 2 of 4

PROJECT NO.: FE-P# 22-12469/70

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 5210 Innes Road, Ottawa, ON

DRILLING METHOD: Truck, Mud Rotary

DRILLING DATE: 22 September, 2022

DEPTH (feet) DEPTH (meters)	SOIL PROFILE		SAMPLES			PENETRATION TESTING (SPT) ▲				VAPOUR READING (ppm) □				PIEZOMETER OR WELL CONSTRUCTION								
	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE	SHEAR STRENGTH (Kpa) ✚				MOISTURE CONTENT (%) ●											
							20	40	60	80	20	40	60		80	10	20	30	40			
36 11	CLAY: Grey, wet, very soft																					
38																						
40 12																						
42																						
44																						
46 14																						
48																						
50 15																						
52																						
54 16																						
56																						
58 17																						
60																						
62 18																						
64																						
66 19																						
68																						
70 21																						

Groundwater Depth (m): on completion: N/A, Mud Rotary, on 6 October 2022: 2.36m

DRAWN: D.C. | LOGGED: J.Y. | CHECKED: C.W.



# LOG OF BOREHOLE

NO. BH106(MW) SHEET. 3 of 4

PROJECT NO.: FE-P# 22-12469/70

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 5210 Innes Road, Ottawa, ON

DRILLING METHOD: Truck, Mud Rotary

DRILLING DATE: 22 September, 2022

DEPTH (feet) DEPTH (meters)	SOIL PROFILE		SAMPLES			PENETRATION TESTING (SPT) ▲				VAPOUR READING (ppm) □				PIEZOMETER OR WELL CONSTRUCTION	
	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE	SHEAR STRENGTH (Kpa) +				MOISTURE CONTENT (%) ●				
							20	40	60	80	20	40	60		80
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100 102 104	CLAY: Grey, wet, very soft														
			27.43/ 60.35		SS-5	0									
					SS-6	1									
	GRAVELLY SAND: Grey, some clay/silt, pieces of crushed rock, wet, very dense				SS-7	100+									
					SS-8	76									
	CRUSHED ROCK: Grey, wet, very dense Auger refusal @ 32.33m probably due to chunk/piece of rock		31.39/ 56.39												

Groundwater Depth (m): on completion: N/A, Mud Rotary, on 6 October 2022: 2.36m

DRAWN: D.C. | LOGGED: J.Y. | CHECKED: C.W.



# LOG OF BOREHOLE

NO. BH106(MW) SHEET. 4 of 4

PROJECT NO.: FE-P# 22-12469/70

PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 5210 Innes Road, Ottawa, ON

DRILLING METHOD: Truck, Mud Rotary

DRILLING DATE: 22 September, 2022

DEPTH (feet) (meters)	SOIL PROFILE		SAMPLES			PENETRATION TESTING (SPT) ▲				VAPOUR READING (ppm) □				PIEZOMETER OR WELL CONSTRUCTION				
	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE	SHEAR STRENGTH (Kpa) +				MOISTURE CONTENT (%) ●							
							20	40	60	80	20	40	60		80	10	20	30
32	CRUSHED ROCK: Grey, wet, very dense Auger refusal @ 32.33m probably due to chunk/piece of rock End of borehole at 32.33m		32.33 55.45			SS-9	100+											
33																		
34																		
35																		
36																		
37																		
38																		
39																		
40																		
41																		
42																		

Groundwater Depth (m): on completion: N/A, Mud Rotary, on 6 October 2022: 2.36m

DRAWN: D.C. | LOGGED: J.Y. | CHECKED: C.W.





PROJECT NAME: GEOTECHNICAL INVESTIGATION

LOCATION: 5210 Innes Road, Ottawa

DRILLING METHOD: Geo-probe Solid Steam

DRILLING DATE: 8 March 2021

DEPTH (m)	SOIL PROFILE		SAMPLES		PENETRATION TESTING (SPT) ▲			VAPOUR READING (ppm) □			PIEZOMETER OR WELL CONSTRUCTION	
	DESCRIPTION	STRATA PLAT	TYPE	NUMBER	SHEAR STRENGTH (kpa) ⊕			MOISTURE CONTENT (%) ○				
					20	40	80	20	40	80		
0	GROUND SURFACE (m est)											
0.5	FILL: organic silty clay, dark, brown, moist	0.00/07.00	SS	1 2								
1.5	FILL: silty clay, trace of rootlets, clayey particles, greyish brown, moist, silt	0.29/07.29	SS	2 10								
2.5	SILTY CLAY: greyish brown, moist, firm to soft		SS	3 7								
3.5				4 4								
4.5				5 3								
5.5				6 1								
6.5												
17.69	Grey clay below 4.57m wet DCPT from 5.33m		SS	7 2								
18.29	become harder at 17.69m			8 3								
18.29	End of BH at 18.29m			9 3								
				10 3								
				11 4								
				12 4								
				13 4								
				14 4								
				15 4								
				16 4								
				17 5								
				18 5								
				19 5								
				20 5								
				21 6								
				22 7								
				23 7								
				24 6								
				25 7								
				26 7								
				27 8								
				28 8								
				29 8								
				30 8								
				31 9								
				32 10								
				33 11								
				34 10								
				35 10/11								
				36 11/12								

Groundwater Depth (m): On Completion: 5.49m

PEUW: Drop Under Hammer Weight

LOGGED: ZA

CHECKED: FF



PROJECT NAME: GEOTECHNICAL INVESTIGATION

LOCATION: 5210 Innes Road, Ottawa

DRILLING METHOD: Geo-probe Solid Steam

DRILLING DATE: 9 March 2021

DEPTH (m)	SOIL PROFILE		SAMPLES		PENETRATION TESTING (SPT) ▲			VAPOUR READING (ppm) □			PIEZOMETER OR WELL CONSTRUCTION		
	DESCRIPTION	STRATA PLAT	ELEV. DEPTH (m)	TYPE	NUMBER	% VALUE	SHEAR STRENGTH (kpa) ⊕			MOISTURE CONTENT (% O)			
							20	40	80	20		40	80
0	GROUND SURFACE (m est)		00.00										
1	FILL: silty clay, some rootlets, brown, wet		01.28/01.28		SS 1	1							
2	FILL: silty clay, greyish brown, trace of rootlets		02.17/02.17		SS 2	11							
3	SILTY CLAY: grey, moist, firm to soft		03.66/03.66		SS 3	4							
4				SS 4	5								
5	clay below 3.05m very soft below 3.05m		05.14/05.14		SS 5	1							
6													
7	DCPT from 3.66m		07.25/07.25										
8													
9	soft below 7.92m		07.92/07.92										
10													
11					7	2							
12					8	3							
13					9	3							
14					10	3							
15					11	3							
16					12	3							
17					13	3							
18					14	3							
19					15	3							
20					16	4							
21					17	4							
22					18	4							
23					19	4							
24					20	4							
25					21	5							
26					22	4							
27					23	5							
28					24	4							
29					25	5							
30					26	6							
31					27	5							
32					28	5							
33					29	5							
34					30	5							
35					31	6							
36					32	5							
37					33	6							
38					34	5							
39					35	6							
40					36	7							
41					37	6							
42					38	6							
43					39	6							
44					40	6							
45					41	7							
46					42	7							
47					43	7							
48					44	8							
49					45	7							
50					46	7							
51					47	7							
52					48	7							
53					49	7							
54					50	7							
55					51	8							
56					52	7							
57					53	8							
58					54	8							
59					55	8							
60					56	9							
61					57	8							
62					58	8							
63					59	21							
64					60	54							
65					61	81							
66					62	74							
67					63	84							
68					64	88							
69													
70													
71													
72													
73													
74													
75													
76													
77													
78													
79													
80													
81													
82													
83													
84													

Groundwater Depth (m): On Completion 1.52m

PEUW: Drop Under Hammer Weight

LOGGED: ZA

CHECKED: FF

Refused to cone penetration at 25.3m possibly due to bedrock.



PROJECT NAME: GEOTECHNICAL INVESTIGATION

LOCATION: 5210 Innes Road, Ottawa

DRILLING METHOD: Geo-probe Solid Steam

DRILLING DATE: 9 March 2021

DEPTH (m)	SOIL PROFILE		SAMPLES		PENETRATION TESTING (SPT) ▲			VAPOUR READING (ppm) □			PIEZOMETER OR WELL CONSTRUCTION
	DESCRIPTION	STRATA PLAT	TYPE	NUMBER	SHEAR STRENGTH (kpa) ⊕			MOISTURE CONTENT (% O)			
					20	40	80	20	40	80	
0	GROUND SURFACE (m est)										
0.5	FILL: organic silty clay, trace of rootlets, bake to dark brown, moist	67.85	SS	1	3						
1.5	FILL: silty clay, trace of rootlets greyish brown, moist	67.84	SS	2	9						
3.66	SILTY CLAY: grey, moist, stiff to very stiff	67.83	SS	3	9						
3.66	DCPT from 3.66m		SS	4	15						
6				6	19						
7				7	10						
8				8	18						
9				9	14						
10				10	12						
11				11	11						
12				12	9						
13				13	8						
14				14	7						
15				15	8						
16				16	8						
17				17	5						
18				18	8						
19				19	7						
20				20	7						
21				21	9						
22				22	9						
23				23	10						
24				24	12						
25				25	12						
26				26	11						
27				27	10						
28				28	10						
29				29	12						
30				30	11						
31				31	12						
32				32	12						
33				33	13						
34				34	14						
35				35	12						
36				36	13						
37				37	11						
38				38	11						
39				39	14						
40				40	12						
41				41	12						
42				42	13						
43				43	13						
44				44	15						
45				45	16						
46				46	14						
47				47	14						
48				48	15						
49				49	17						
50				50	18						
51				51	18						
52				52	17						
53				53	19						
54				54	88						
55				55	58						
56				56	52						
57				57	51						
58				58	45						
59				59	47						
60				60	58						
61				61	37						
62				62	38						
63				63	85						
64				64	38						
65				65	38						
66				66	42						
67				67	29						
68				68	46						
69				69	64						
70				70	42						
71				71	43						
72				72	34						
73				73	55						
74				74	43						
75				75	87						
76				76	44						
24.99	become harder below 24.08m										
24.99	Bounce at 24.99m										
25.30	End of BH at 25.30m										
25.30											

Refused to cone penetration at 25.3m possibly due to bedrock.



# LOG OF BOREHOLE

NO. TH1 SHEET. 1 of 1

PROJECT NO.: FE-P# 22-12469/70

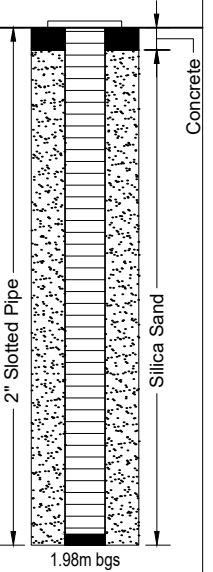
PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 5210 Innes Road, Ottawa, ON

DRILLING METHOD: Truck, Solid Stem

DRILLING DATE: 23 September, 2022

DEPTH (feet) (meters)	SOIL PROFILE		SAMPLES			PENETRATION TESTING (SPT) ▲				VAPOUR READING (ppm) □				PIEZOMETER OR WELL CONSTRUCTION	
	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE	SHEAR STRENGTH (Kpa) ✚				MOISTURE CONTENT (%) ●				
							20	40	60	80	20	40	60		80
0	Augered to 1.52m		87.77												
1.52	SILTY CLAY: Grey, moist, soft		86.25		SS-1	7	▲						47.3%		
1.98	End of test hole at 1.98m		85.79												



Groundwater Depth (m): on completion: Dry

DRAWN: D.C.

LOGGED: J.Y.

CHECKED: C.W.



# LOG OF BOREHOLE

NO. TH2 SHEET. 1 of 1

PROJECT NO.: FE-P# 22-12469/70

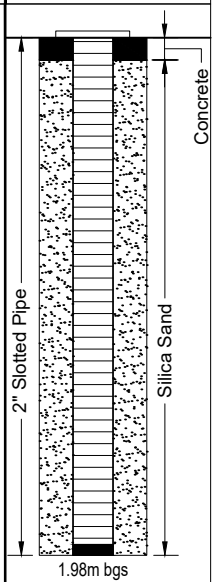
PROJECT NAME: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

LOCATION: 5210 Innes Road, Ottawa, ON

DRILLING METHOD: Truck, Solid Stem

DRILLING DATE: 23 September, 2022

DEPTH (feet) (meters)	SOIL PROFILE		SAMPLES			PENETRATION TESTING (SPT) ▲				VAPOUR READING (ppm) □				PIEZOMETER OR WELL CONSTRUCTION	
	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE	SHEAR STRENGTH (Kpa) ✚				MOISTURE CONTENT (%) ●				
							20	40	60	80	20	40	60		80
0	Augered to 1.52m		87.66												
1.52	SILTY CLAY: Grey, moist, soft		86.14			SS-1	6	▲						42.8%	●
1.98	End of test hole at 1.98m		85.68												



Groundwater Depth (m): on completion: Dry

DRAWN: D.C.

LOGGED: J.Y.

CHECKED: C.W.

**APPENDIX C – MOISTURE CONTENT AND GRAIN SIZE DISTRIBUTION  
ANALYSES**





**Project Name:** Geotechnical Investigation

**F.E. Lab #:** 22-495

**Client:** Dymon Group of Companies

**Date Sampled:** 20-Sep-2022

**Project ID:** 22-12470

**Date Received:** 26-Sep-2022

**Location:** 5210 Innes Road  
Ottawa, Ontario

**Date Reported:** 18-Oct-2022

### Certificate of Analysis

Analyses	Matrix	Quantity	Testing Date	Method Reference
Moisture Content	Soil	6	26-Sep-22	ASTM D2216
Grain Size (Sieve Analysis)	Soil	0	N.A.	LS-602
Grain Size (Hydrometer)	Soil	5	12-Oct-22	LS-702
Atterberg test	Soil	0	N.A.	LS-703/704

*Behnam Sayad-Pour*  
Authorized by:

Behnam Sayad Pour Zanjani  
Geo-Lab Supervisor

## Certificate of Analysis

<b>Analysis Requested:</b> Moisture Content	<b>Sample Description:</b> 6 Soil Sample(s)
---	---

<b>Sample Info</b>	BH2 SS3	BH3 SS3	BH4 SS2	BH4 SS3	BH4 SS4	TH1
<b>Sample Depth (m)</b>	1.53-1.98	1.53-1.98	0.76-1.22	1.53-1.98	2.29-2.75	1.53-1.98
<b>Moisture Content (%)</b>	48.2	45.8	35.5	44.9	58.9	47.3

<b>Sample Info</b>	TH2					
<b>Sample Depth (m)</b>	1.53-1.98					
<b>Moisture Content (%)</b>	42.8					





## Grain Size Distribution

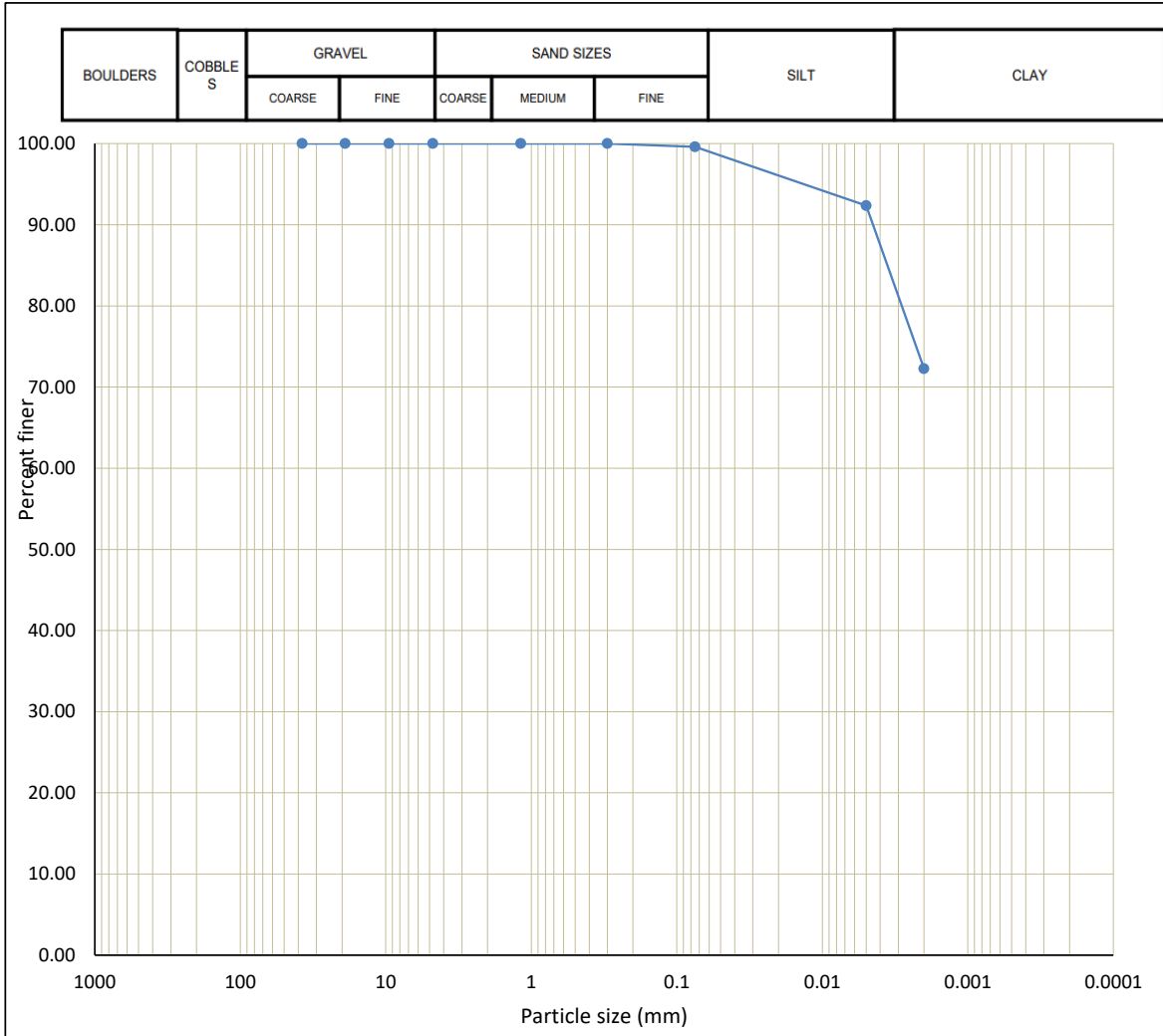
Sample ID: 22-508 BH2 SS3 1.53-1.98

Gravel: 0%

Sand: 0%

Silt: 27%

Clay: 72%



Sample ID: 22-508 BH2 SS3 1.53-1.98		
Diameter	Weight (%)	Grain Size
>4.75mm	0.0	Gravel
1.18mm-4.75mm	0.0	Coarse Sand
300um-1.18mm	0.0	Medium Sand
75um-300um	0.4	Fine Sand
5um-75um	7	Silt
2um-5um	20	
<2um	72	Clay

## Grain Size Distribution

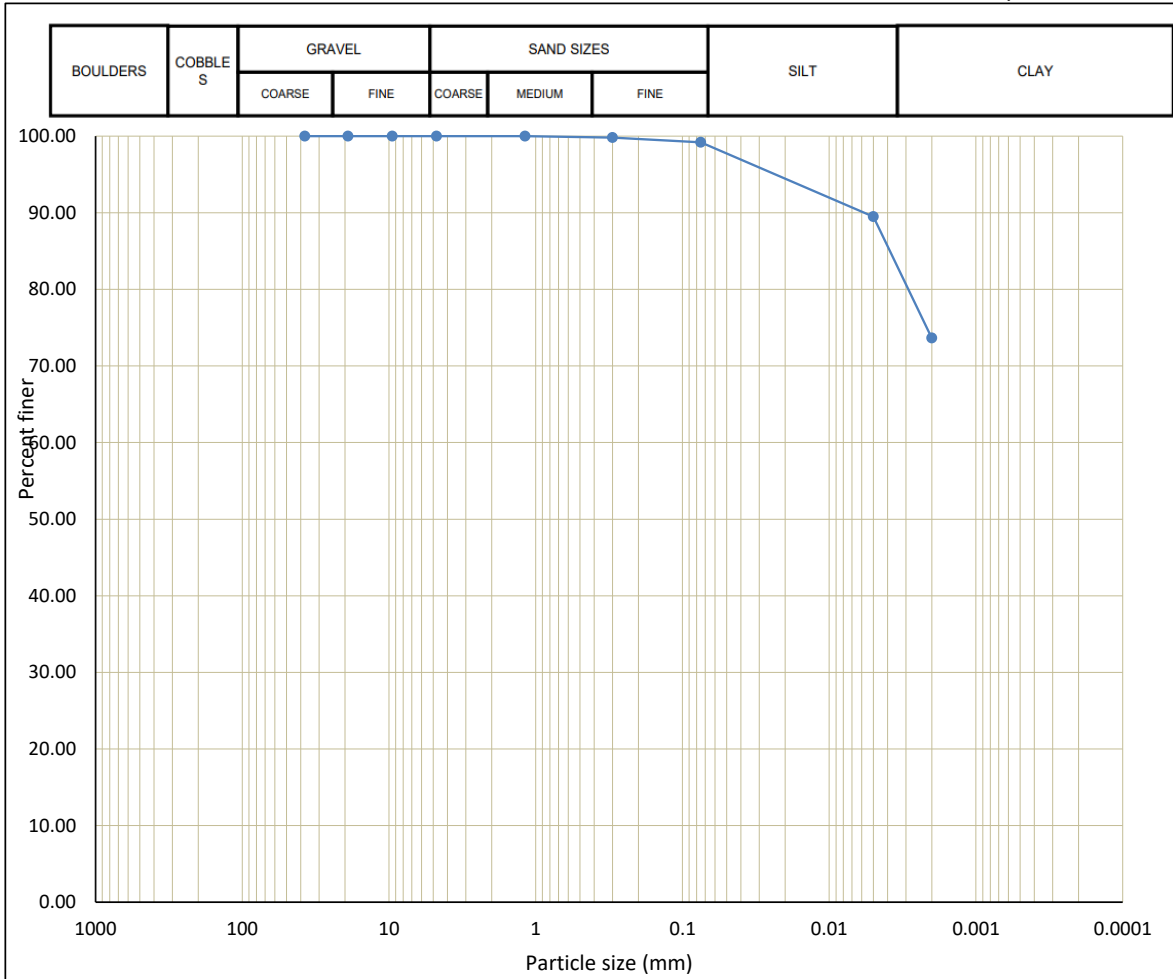
Sample ID: 22-509 BH3 SS3 1.53-1.98

Gravel: 0%

Sand: 1%

Silt: 26%

Clay: 74%

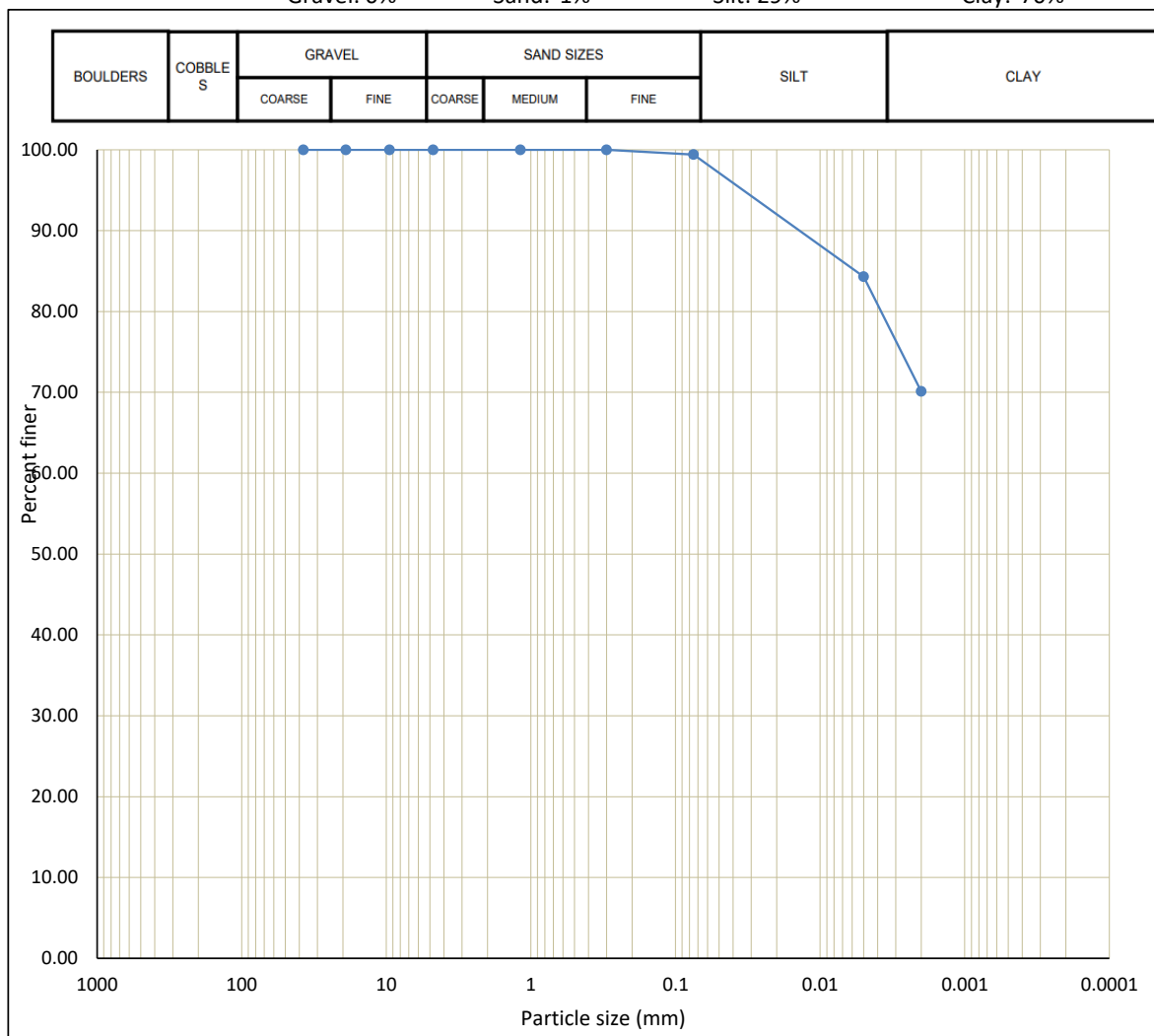


Sample ID: 22-509 BH3 SS3 1.53-1.98		
Diameter	Weight (%)	Grain Size
>4.75mm	0.0	Gravel
1.18mm-4.75mm	0.0	Coarse Sand
300um-1.18mm	0.2	Medium Sand
75um-300um	0.6	Fine Sand
5um-75um	10	Silt
2um-5um	16	
<2um	74	Clay

# Grain Size Distribution

Sample ID: 22-510 BH4 SS2 0.76-1.22

Gravel: 0%      Sand: 1%      Silt: 29%      Clay: 70%



Sample ID: 22-510 BH4 SS2 0.76-1.22		
Diameter	Weight (%)	Grain Size
>4.75mm	0.0	Gravel
1.18mm-4.75mm	0.0	Coarse Sand
300um-1.18mm	0.0	Medium Sand
75um-300um	0.6	Fine Sand
5um-75um	15	Silt
2um-5um	14	
<2um	70	Clay

# Grain Size Distribution

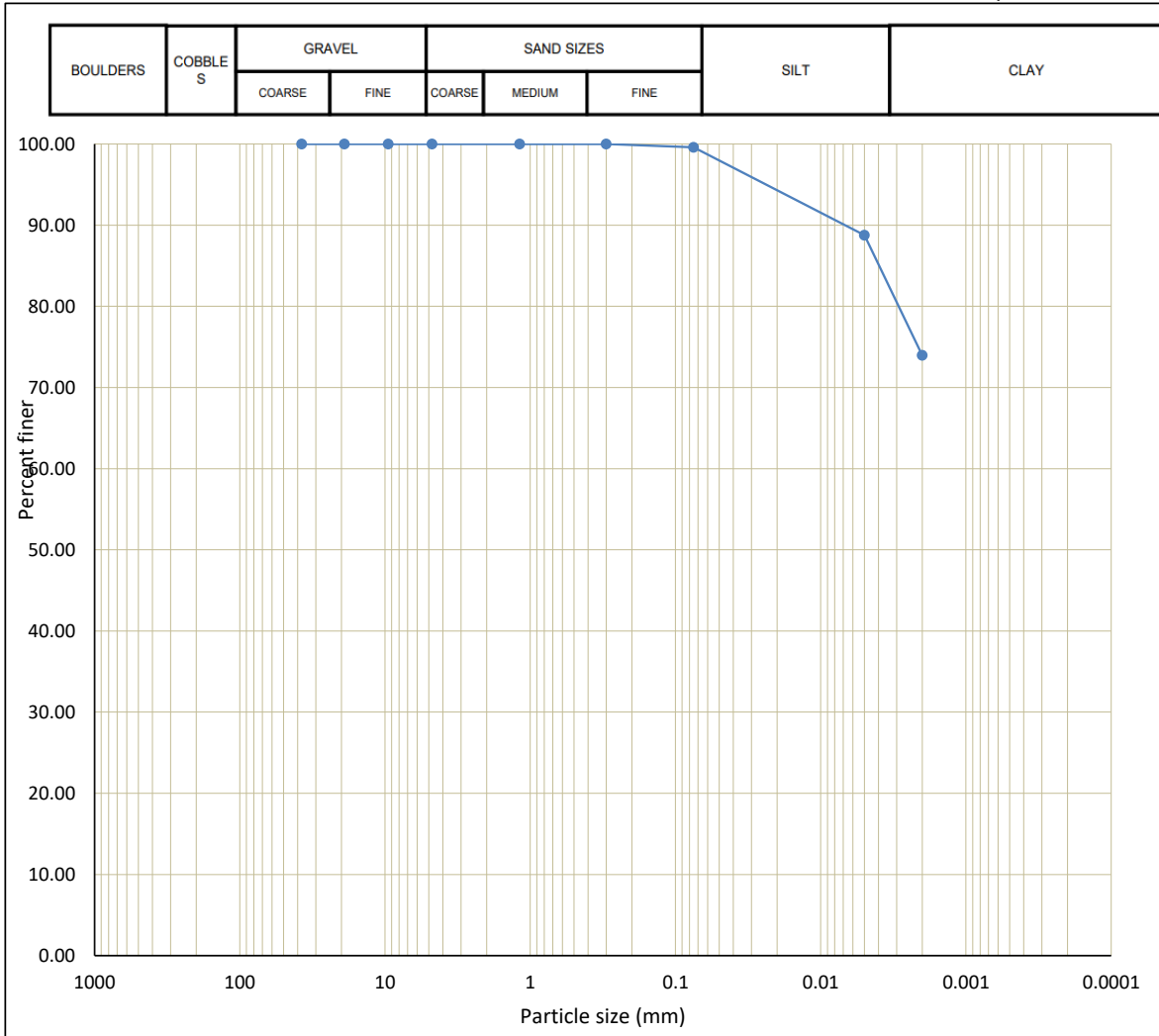
Sample ID: 22-511 TH1 1.53-1.98

Gravel: 0%

Sand: 0%

Silt: 26%

Clay: 74%



Sample ID: 22-511 TH1 1.53-1.98		
Diameter	Weight (%)	Grain Size
>4.75mm	0.0	Gravel
1.18mm-4.75mm	0.0	Coarse Sand
300um-1.18mm	0.0	Medium Sand
75um-300um	0.4	Fine Sand
5um-75um	11	Silt
2um-5um	15	
<2um	74	Clay

## Grain Size Distribution

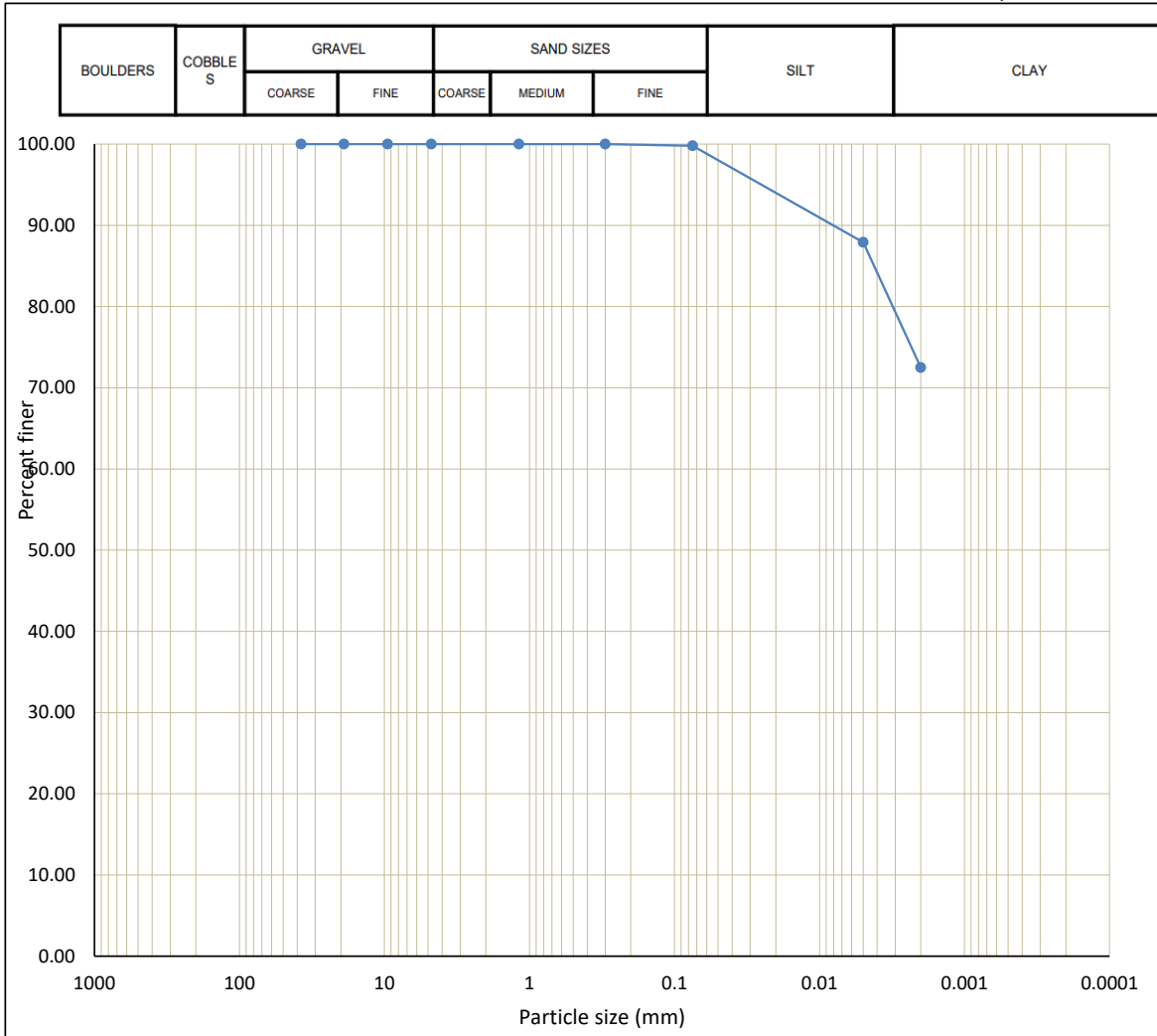
Sample ID: 22-512 TH2 1.53-1.98

Gravel: 0%

Sand: 0%

Silt: 27%

Clay: 72%



Sample ID: 22-512 TH2 1.53-1.98		
Diameter	Weight (%)	Grain Size
>4.75mm	0.0	Gravel
1.18mm-4.75mm	0.0	Coarse Sand
300um-1.18mm	0.0	Medium Sand
75um-300um	0.2	Fine Sand
5um-75um	12	Clay
2um-5um	15	
<2um	72	



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LAB JOB No: \_\_\_\_\_ Page 1 of 1

<b>CLIENT INFORMATION</b> Name: _____ Contact: _____ Address: 5210 IMMES Email: _____ Fax: _____ Fax results <input type="checkbox"/> Phone: _____ Email results <input checked="" type="checkbox"/>	<b>PROJECT INFORMATION</b> Project Name: 5210 IMMES Project ID: 77-12470 Sampled By: _____ <b>TURNAROUND TIME (TAT): Check ONE if all samples are the same/or see below.</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">STD - Standard (5-7 bus. days)</td> <td style="width: 33%;"></td> <td style="width: 33%;">Standard Charge</td> </tr> <tr> <td>3D - Three-Day (72 hrs.)</td> <td>+25%</td> <td>           SURCHARGES MAY APPLY            Custom quotations (if applicable) will be reflected on final billing.            CALL for: Emergencies, Bulk Quotes, or other Questions.         </td> </tr> </table>	STD - Standard (5-7 bus. days)		Standard Charge	3D - Three-Day (72 hrs.)	+25%	SURCHARGES MAY APPLY Custom quotations (if applicable) will be reflected on final billing. CALL for: Emergencies, Bulk Quotes, or other Questions.	<b>BILLING INFORMATION</b> Purchase Order No: _____ Verbal Authorization: _____ Credit Card Type (e.g. MC/Visa/AMEX...): _____ Credit Card #: _____ Expiry Date: _____
STD - Standard (5-7 bus. days)		Standard Charge						
3D - Three-Day (72 hrs.)	+25%	SURCHARGES MAY APPLY Custom quotations (if applicable) will be reflected on final billing. CALL for: Emergencies, Bulk Quotes, or other Questions.						

LAB	CLIENT'S SAMPLE ID	SAMPLING	SAMPLE	CONTAINER	TAT	ANALYSIS REQUESTED (Check or Specify)										NOTES	
						Moisture Content	Sieve Analysis	Hydrometer	Atterberg Limits	Proctor							
1	BH2 5'-6.5'	· Sep 20	Soil	bag	STD	✓	✗	✓									
2	BH4 2.5'-4'	↓	Soil	bag	↓		✗	✓									
	5'-6.5'		Soil	bag	↓			✗									
	10-11.5'		Soil	bag	↓			✗									
3	BH3 5'-6.5'		Soil	bag	↓				✓								
4	TH1 5'-6.5'		Soil	bag	↓			✓									
5	TH2 5'-6.5'		Soil	bag	↓			✓									

<b>Relinquished by:</b> Name: (print) JAMAL, Clive Signature: Date & Time: Sep 26 Method of Shipment: by hand	<b>Client's Comments:</b>  	<b>Regulatory Requirements:</b> OPSS Reg. <hr/> <b>Purpose for sampling:</b> <table style="width: 100%;"> <tr> <td>Road Base</td> <td>Engineering Fill</td> </tr> <tr> <td>Road Subbase</td> <td>Soil Classification</td> </tr> <tr> <td>Subgrade</td> <td>Other</td> </tr> <tr> <td>Backfill</td> <td></td> </tr> </table>	Road Base	Engineering Fill	Road Subbase	Soil Classification	Subgrade	Other	Backfill	
Road Base	Engineering Fill									
Road Subbase	Soil Classification									
Subgrade	Other									
Backfill										
<b>Received by (Internal):</b> Name: _____ Date & Time: _____	<b>Arrival Temperature °C:</b> Laboratory Remarks: _____									



# FISHER ENVIRONMENTAL LABORATORIES

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**Tel.:**  
**Email:**  
**Attn.:**

**F.E. Job #:** 21-6138  
**Project Name:** Geotechnical  
**Project ID:** FE-P 21-10991  
**Date Sampled:** 8, 9-Mar-2021  
**Date Received:** 10-Mar-2021  
**Date Reported:** 17-Mar-2021  
**Location:** 5210 Innes Road  
Ottawa, ON

## Certificate of Analysis

Analyses	Matrix	Quantity	Date Extracted	Date Analyzed	Lab SOP	Method Reference
Moisture Content	Soil	7	N/A	12-Mar-21	Support Procedures F-99	Carter (1993)

Fisher Environmental Laboratories is accredited by CALA (the Canadian Association for Laboratory Accreditation Inc.) for specific parameters as required by Ontario Regulation 153/04. All analytical testing has been performed in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act published by Ontario Ministry of the Environment.

**Authorized by:**   
Roger Lin, Ph. D., C. Chem.  
Laboratory Manager





## Certificate of Analysis

<b>Analysis Requested:</b>	Moisture Content
<b>Sample Description:</b>	7 Soil Sample(s)

Parameter	21-6138-1 BH1 0.75-1.35m	21-6138-2 BH1 2.25-2.85m	21-6138-3 BH1 4.55-5.15m	21-6138-4 BH2 1.50-2.10m	21-6138-5 BH2 3.00-3.60m	21-6138-6 BH3 0.75-1.35m
<b>Moisture Content (%)</b>	37	44	73	48	68	34

Parameter	21-6138-7 BH3 2.25-2.85m					
<b>Moisture Content (%)</b>	43					

## QA/QC Report

Parameter	Blank	RL	LCS	AR	Duplicate	AR
			Recovery (%)		RPD (%)	
<b>Moisture Content (%)</b>	<0.1	0.1	100	70-130	4.0	0-20

**LEGEND:**

- RL - Reporting Limit
- LCS - Laboratory Control Sample
- AR - Acceptable Range
- RPD - Relative Percent Difference

## **APPENDIX D – SEWER BYLAW RESULTS**





## CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

<p><b>Work Order</b> : <b>WT2217418</b></p> <p><b>Client</b> : <b>Fisher Environmental Ltd.</b></p> <p><b>Contact</b> : Clive Wiggan</p> <p><b>Address</b> : 15-400 Esna Park Drive Markham ON Canada L3R 3K2</p> <p><b>Telephone</b> : 905 475 7755, Ext. 29</p> <p><b>Project</b> : ----</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-1004260</p> <p><b>Sampler</b> : CLIENT</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : FISHER ENVIRONMENTAL - ALS 2022 STANDING OFFER</p> <p><b>No. of samples received</b> : 1</p> <p><b>No. of samples analysed</b> : 1</p>	<p><b>Page</b> : 1 of 7</p> <p><b>Laboratory</b> : Waterloo - Environmental</p> <p><b>Account Manager</b> : Emily Hansen</p> <p><b>Address</b> : 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8</p> <p><b>Telephone</b> : +1 519 886 6910</p> <p><b>Date Samples Received</b> : 11-Oct-2022 15:52</p> <p><b>Date Analysis Commenced</b> : 12-Oct-2022</p> <p><b>Issue Date</b> : 25-Oct-2022 13:48</p>
---	--

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.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Adam Boettger	Team Leader - LCMS	LCMS, Waterloo, Ontario
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Microbiology, Waterloo, Ontario
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Danielle Gravel	Team Leader - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
David Tremblett	Team Leader - Volatiles	Air Quality, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Metals, Waterloo, Ontario
Jocelyn Kennedy	Department Manager - Semi-Volatile Organics	Organics, Waterloo, Ontario
Rachel Cameron	Team Leader - Semi-Volatile Organics	Organics, Waterloo, Ontario
Sarah Birch	Team Leader - Volatiles	Organics, Waterloo, Ontario

## General Comments

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

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

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

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

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

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

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

<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 .

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
BODL	Limit of Reporting for BOD was increased to account for the largest volume of sample tested.



## Analytical Results

				Client sample ID						
				5210 INNES RD OTTAWA-MW5						
Sub-Matrix: Water (Matrix: Water)				Sampling date/time	11-Oct-2022 17:06					
Analyte	Method	LOR	Unit	WT2217418-001	COOSUB SAN	COOSUB STM				
<b>Physical Tests</b>										
pH	E108	0.10	pH units	8.30	5.5 - 11 pH units	6 - 9 pH units	--	--	--	--
solids, total suspended [TSS]	E160	3.0	mg/L	4.6	350 mg/L	15 mg/L	--	--	--	--
<b>Anions and Nutrients</b>										
fluoride	E235.F	0.020	mg/L	0.545	10 mg/L	--	--	--	--	--
Kjeldahl nitrogen, total [TKN]	E318	0.050	mg/L	0.452	100 mg/L	--	--	--	--	--
phosphorus, total	E372-U	0.0020	mg/L	0.0430	10 mg/L	0.4 mg/L	--	--	--	--
sulfate (as SO4)	E235.SO4	0.30	mg/L	13.8	--	--	--	--	--	--
<b>Cyanides</b>										
cyanide, strong acid dissociable (total)	E333	0.0020	mg/L	<0.0020	2 mg/L	0.02 mg/L	--	--	--	--
<b>Total Sulfides</b>										
sulfide, total (as H2S)	E395-H	0.011	mg/L	0.015	2 mg/L	--	--	--	--	--
sulfide, total (as S)	E395-H	0.010	mg/L	0.014	2 mg/L	--	--	--	--	--
<b>Microbiological Tests</b>										
coliforms, Escherichia coli [E. coli]	E012A.EC	1	CFU/100mL	<1	--	200 CFU/100mL	--	--	--	--
<b>Total Metals</b>										
aluminum, total	E420	0.0030	mg/L	0.104	50 mg/L	--	--	--	--	--
antimony, total	E420	0.00010	mg/L	0.00054	5 mg/L	--	--	--	--	--
arsenic, total	E420	0.00010	mg/L	0.00141	1 mg/L	0.02 mg/L	--	--	--	--
bismuth, total	E420	0.000050	mg/L	<0.000050	5 mg/L	--	--	--	--	--
boron, total	E420	0.010	mg/L	0.049	25 mg/L	--	--	--	--	--
cadmium, total	E420	0.0000050	mg/L	0.0000583	0.02 mg/L	0.008 mg/L	--	--	--	--
chromium, total	E420	0.00050	mg/L	<0.00050	5 mg/L	0.08 mg/L	--	--	--	--
cobalt, total	E420	0.00010	mg/L	0.00036	5 mg/L	--	--	--	--	--
copper, total	E420	0.00050	mg/L	0.00244	3 mg/L	0.04 mg/L	--	--	--	--
lead, total	E420	0.000050	mg/L	0.000400	5 mg/L	0.12 mg/L	--	--	--	--
manganese, total	E420	0.00010	mg/L	0.0959	5 mg/L	0.05 mg/L	--	--	--	--
mercury, total	E508	0.0000050	mg/L	<0.0000050	0.001 mg/L	0.0004 mg/L	--	--	--	--
molybdenum, total	E420	0.000050	mg/L	0.0182	5 mg/L	--	--	--	--	--



Analyte	Method	LOR	Unit	WT2217418-001 (Continued)	COOSUB SAN	COOSUB STM				
<b>Total Metals - Continued</b>										
nickel, total	E420	0.00050	mg/L	0.00127	3 mg/L	0.08 mg/L	--	--	--	--
selenium, total	E420	0.000050	mg/L	0.000101	5 mg/L	0.02 mg/L	--	--	--	--
silver, total	E420	0.000010	mg/L	<0.000010	5 mg/L	0.12 mg/L	--	--	--	--
tin, total	E420	0.00010	mg/L	0.0141	5 mg/L	--	--	--	--	--
titanium, total	E420	0.00030	mg/L	0.00414	5 mg/L	--	--	--	--	--
vanadium, total	E420	0.00050	mg/L	0.00212	5 mg/L	--	--	--	--	--
zinc, total	E420	0.0030	mg/L	0.0034	3 mg/L	0.04 mg/L	--	--	--	--
<b>Aggregate Organics</b>										
carbonaceous biochemical oxygen demand [CBOD]	E555	2.0	mg/L	<3.0 BODL	300 mg/L	25 mg/L	--	--	--	--
oil & grease (gravimetric)	E567	5.0	mg/L	<5.0	--	--	--	--	--	--
oil & grease, animal/vegetable (gravimetric)	EC567A.SG	5.0	mg/L	<5.0	150 mg/L	--	--	--	--	--
oil & grease, mineral (gravimetric)	E567SG	5.0	mg/L	<5.0	15 mg/L	--	--	--	--	--
phenols, total (4AAP)	E562	0.0010	mg/L	0.0040	1 mg/L	0.008 mg/L	--	--	--	--
<b>Volatile Organic Compounds [Fuels]</b>										
trimethylbenzene, 1,3,5-	E611F	0.50	µg/L	<0.50	3 µg/L	--	--	--	--	--
benzene	E611D	0.50	µg/L	<0.50	10 µg/L	2 µg/L	--	--	--	--
bromodichloromethane	E611D	0.50	µg/L	<0.50	350 µg/L	--	--	--	--	--
bromoform	E611D	0.50	µg/L	<0.50	630 µg/L	--	--	--	--	--
bromomethane	E611D	0.50	µg/L	<0.50	110 µg/L	--	--	--	--	--
carbon tetrachloride	E611D	0.20	µg/L	<0.20	57 µg/L	--	--	--	--	--
chlorobenzene	E611D	0.50	µg/L	<0.50	57 µg/L	--	--	--	--	--
chloroethane	E611D	0.50	µg/L	<0.50	270 µg/L	--	--	--	--	--
chloroform	E611D	0.50	µg/L	<0.50	80 µg/L	2 µg/L	--	--	--	--
chloromethane	E611D	2.0	µg/L	<2.0	190 µg/L	--	--	--	--	--
dibromochloromethane	E611D	0.50	µg/L	<0.50	57 µg/L	--	--	--	--	--
dibromoethane, 1,2-	E611D	0.20	µg/L	<0.20	28 µg/L	--	--	--	--	--
dichlorobenzene, 1,2-	E611D	0.50	µg/L	<0.50	88 µg/L	5.6 µg/L	--	--	--	--
dichlorobenzene, 1,3-	E611D	0.50	µg/L	<0.50	36 µg/L	--	--	--	--	--
dichlorobenzene, 1,4-	E611D	0.50	µg/L	<0.50	17 µg/L	6.8 µg/L	--	--	--	--
dichloroethylene, cis-1,2-	E611D	0.50	µg/L	<0.50	200 µg/L	5.6 µg/L	--	--	--	--
dichloromethane	E611D	1.0	µg/L	<1.0	211 µg/L	5.2 µg/L	--	--	--	--
dichloropropylene, trans-1,3-	E611D	0.30	µg/L	<0.30	70 µg/L	5.6 µg/L	--	--	--	--
ethylbenzene	E611D	0.50	µg/L	<0.50	57 µg/L	2 µg/L	--	--	--	--



Analyte	Method	LOR	Unit	WT2217418-001 (Continued)	COOSUB SAN	COOSUB STM				
<b>Volatile Organic Compounds - Continued</b>										
tetrachloroethane, 1,1,2,2-	E611D	0.50	µg/L	<0.50	40 µg/L	17 µg/L	--	--	--	--
tetrachloroethylene	E611D	0.50	µg/L	<0.50	50 µg/L	4.4 µg/L	--	--	--	--
toluene	E611D	0.50	µg/L	<0.50	80 µg/L	2 µg/L	--	--	--	--
trichloroethylene	E611D	0.50	µg/L	<0.50	54 µg/L	7.6 µg/L	--	--	--	--
trichlorofluoromethane	E611D	0.50	µg/L	<0.50	20 µg/L	--	--	--	--	--
vinyl chloride	E611D	0.50	µg/L	<0.50	400 µg/L	--	--	--	--	--
xylene, m+p-	E611D	0.40	µg/L	<0.40	--	--	--	--	--	--
xylene, o-	E611D	0.30	µg/L	<0.30	--	--	--	--	--	--
xylenes, total	E611D	0.50	µg/L	<0.50	320 µg/L	4.4 µg/L	--	--	--	--
<b>Volatile Organic Compounds Surrogates</b>										
bromofluorobenzene, 4-	E611D	1.0	%	97.8	--	--	--	--	--	--
difluorobenzene, 1,4-	E611D	1.0	%	98.9	--	--	--	--	--	--
<b>Polycyclic Aromatic Hydrocarbons</b>										
anthracene	E641A-L	0.000010	mg/L	<0.000010	--	--	--	--	--	--
benz(a)anthracene	E641A-L	0.000010	mg/L	<0.000010	--	--	--	--	--	--
benzo(a)pyrene	E641A-L	0.0000050	mg/L	<0.0000050	--	--	--	--	--	--
benzo(b+j)fluoranthene	E641A-L	0.000010	mg/L	<0.000010	--	--	--	--	--	--
benzo(e)pyrene	E641A-L	0.000010	mg/L	<0.000010	--	--	--	--	--	--
benzo(g,h,i)perylene	E641A-L	0.000010	mg/L	<0.000010	--	--	--	--	--	--
benzo(k)fluoranthene	E641A-L	0.000010	mg/L	<0.000010	--	--	--	--	--	--
chrysene	E641A-L	0.000010	mg/L	<0.000010	--	--	--	--	--	--
dibenz(a,h)acridine	E642D	0.000050	mg/L	<0.000056	--	--	--	--	--	--
dibenz(a,h)anthracene	E641A-L	0.0000050	mg/L	<0.0000050	--	--	--	--	--	--
dibenz(a,j)acridine	E642D	0.000050	mg/L	<0.000056	--	--	--	--	--	--
dibenzo(a,i)pyrene	E642D	0.000050	mg/L	<0.000056	--	--	--	--	--	--
dibenzo(c,g)carbazole, 7H-	E642D	0.000050	mg/L	<0.000056	--	--	--	--	--	--
dinitropyrene, 1,3-	E642D	0.0010	mg/L	<0.0010	--	--	--	--	--	--
dinitropyrene, 1,6-	E642D	0.0010	mg/L	<0.0010	--	--	--	--	--	--
dinitropyrene, 1,8-	E642D	0.0010	mg/L	<0.0010	--	--	--	--	--	--
fluoranthene	E641A-L	0.000010	mg/L	<0.000010	--	--	--	--	--	--
fluorene	E655B	0.20	µg/L	<0.20	59 µg/L	--	--	--	--	--
indeno(1,2,3-c,d)pyrene	E641A-L	0.000010	mg/L	<0.000010	--	--	--	--	--	--
methylcholanthrene, 3-	E642D	0.000050	mg/L	<0.000056	--	--	--	--	--	--
methylnaphthalene, 1-	E655B	0.40	µg/L	<0.40	32 µg/L	--	--	--	--	--
methylnaphthalene, 2-	E655B	0.40	µg/L	<0.40	22 µg/L	--	--	--	--	--
naphthalene	E655B	0.20	µg/L	<0.20	59 µg/L	6.4 µg/L	--	--	--	--



Analyte	Method	LOR	Unit	WT2217418-001 (Continued)	COOSUB SAN	COOSUB STM				
<b>Polycyclic Aromatic Hydrocarbons - Continued</b>										
perylene	E641A-L	0.000010	mg/L	<0.000010	--	--	--	--	--	--
phenanthrene	E641A-L	0.000010	mg/L	0.000073	--	--	--	--	--	--
pyrene	E641A-L	0.000010	mg/L	0.000015	--	--	--	--	--	--
PAHs, total (ON Sewer Use)	EC640A	0.00175	mg/L	<0.00175	--	--	--	--	--	--
chrysene-d12	E641A-L	0.1	%	89.7	--	--	--	--	--	--
naphthalene-d8	E641A-L	0.1	%	84.6	--	--	--	--	--	--
phenanthrene-d10	E641A-L	0.1	%	106	--	--	--	--	--	--
terphenyl-d14, p-	E642D	0.1	%	105	--	--	--	--	--	--
<b>Aldehydes</b>										
Formaldehyde	E693A	2.0	µg/L	7.0	300 µg/L	--	--	--	--	--
<b>Phthalate Esters</b>										
bis(2-ethylhexyl) phthalate [DEHP]	E655B	1.0	µg/L	<1.0	280 µg/L	--	--	--	--	--
butyl benzyl phthalate	E655B	0.40	µg/L	<0.40	17 µg/L	--	--	--	--	--
diethyl phthalate	E655B	0.20	µg/L	<0.20	200 µg/L	--	--	--	--	--
di-n-butyl phthalate	E655B	1.0	µg/L	<1.0	57 µg/L	--	--	--	--	--
di-n-octyl phthalate [DNOP]	E655B	0.40	µg/L	<0.40	30 µg/L	--	--	--	--	--
<b>Semi-Volatile Organics</b>										
bis(2-chloroethoxy)methane	E655B	0.40	µg/L	<0.40	36 µg/L	--	--	--	--	--
indole	E655B	0.40	µg/L	<0.40	50 µg/L	--	--	--	--	--
<b>Semi-Volatile Organics Surrogates</b>										
fluorobiphenyl, 2-	E655B	1.0	%	83.2	--	--	--	--	--	--
nitrobenzene-d5	E655B	1.0	%	117	--	--	--	--	--	--
terphenyl-d14, p-	E655B	1.0	%	81.7	--	--	--	--	--	--
<b>Chlorinated Phenolics</b>										
dichlorophenol, 2,4-	E655B	0.30	µg/L	<0.30	44 µg/L	--	--	--	--	--
tribromophenol, 2,4,6-	E655B	0.50	%	137	--	--	--	--	--	--
<b>Nonylphenols</b>										
nonylphenol diethoxylates [NP2EO]	E749B	0.10	µg/L	<0.10	--	--	--	--	--	--
nonylphenol ethoxylates, total	E749B	2.0	µg/L	<2.0	25 µg/L	10 µg/L	--	--	--	--
nonylphenol monoethoxylates [NP1EO]	E749B	2.0	µg/L	<2.0	--	--	--	--	--	--
nonylphenols [NP]	E749A	1.0	µg/L	<1.0	2.5 µg/L	1 µg/L	--	--	--	--
<b>Polychlorinated Biphenyls</b>										
Aroclor 1016	E687	0.020	µg/L	<0.020	--	--	--	--	--	--





Analyte	Method	LOR	Unit	WT2217418-001 (Continued)	COOSUB SAN	COOSUB STM				
<b>Polychlorinated Biphenyls - Continued</b>										
Aroclor 1221	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1232	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1242	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1248	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1254	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1260	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1262	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
Aroclor 1268	E687	0.020	µg/L	<0.020	--	--	--	--	--	--
polychlorinated biphenyls [PCBs], total	E687	0.060	µg/L	<0.060	--	0.4 µg/L	--	--	--	--
decachlorobiphenyl	E687	0.1	%	105	--	--	--	--	--	--
tetrachloro-m-xylene	E687	0.1	%	104	--	--	--	--	--	--
<b>Organochlorine Pesticides</b>										
hexachlorobenzene	E660F	0.0080	µg/L	<0.0080	0.1 µg/L	0.04 µg/L	--	--	--	--
decachlorobiphenyl	E660F	0.10	%	128	--	--	--	--	--	--
tetrachloro-m-xylene	E660F	0.10	%	104	--	--	--	--	--	--
<b>Nitrosamines</b>										
nitrosodimethylamine, n- [NDMA]	E725A	0.030	µg/L	<0.030	400 µg/L	--	--	--	--	--
nitrosodimethylamine-d6, n-	E725A	0.10	%	104	--	--	--	--	--	--

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

### Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
5210 INNES RD OTTAWA- MW5	Water	manganese, total		COOSUB	STM	0.0959 mg/L	0.05 mg/L

**Key:**

- COOSUB Ontario Ottawa Sanitary and Storm Sewer By-Law No. 2003-514 (2003)
- SAN City of Ottawa Sanitary Sewer Use By-Law 2003-514
- STM City of Ottawa Storm Sewer By-Law 2003-514



## QUALITY CONTROL INTERPRETIVE REPORT

<p><b>Work Order</b> : <b>WT2217418</b></p> <p><b>Client</b> : <b>Fisher Environmental Ltd.</b></p> <p><b>Contact</b> : Clive Wiggan</p> <p><b>Address</b> : 15-400 Esna Park Drive Markham ON Canada L3R 3K2</p> <p><b>Telephone</b> : 905 475 7755, Ext. 29</p> <p><b>Project</b> : ----</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 20-1004260</p> <p><b>Sampler</b> : CLIENT</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : FISHER ENVIRONMENTAL - ALS 2022 STANDING OFFER</p> <p><b>No. of samples received</b> : 1</p> <p><b>No. of samples analysed</b> : 1</p>	<p><b>Page</b> : 1 of 14</p> <p><b>Laboratory</b> : Waterloo - Environmental</p> <p><b>Account Manager</b> : Emily Hansen</p> <p><b>Address</b> : 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8</p> <p><b>Telephone</b> : +1 519 886 6910</p> <p><b>Date Samples Received</b> : 11-Oct-2022 15:52</p> <p><b>Issue Date</b> : 25-Oct-2022 13:48</p>
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This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

**Key**

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

### Workorder Comments

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

### Summary of Outliers

#### Outliers : Quality Control Samples

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

#### Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

### ***Outliers : Analysis Holding Time Compliance (Breaches)***

- No Analysis Holding Time Outliers exist.

### ***Outliers : Frequency of Quality Control Samples***

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



**Outliers : Quality Control Samples**

*Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes*

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
<b>Laboratory Control Sample (LCS) Recoveries</b>								
Polycyclic Aromatic Hydrocarbons	QC-701488-002	----	dibenzo(a,i)pyrene	189-55-9	E642D	59.0 % LCS-ND	60.0-130%	Recovery less than lower control limit
Phthalate Esters	QC-MRG2-70148902	----	di-n-octyl phthalate [DNOP]	117-84-0	E655B	152 % LCS-H	50.0-140%	Recovery greater than upper control limit

**Result Qualifiers**

Qualifier	Description
LCS-H	Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
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	
<b>Aggregate Organics : Biochemical Oxygen Demand (Carbonaceous) - 5 day</b>										
<b>HDPE [BOD HT-4d]</b> 5210 INNES RD OTTAWA- MW5	E555	11-Oct-2022	----	----	----		12-Oct-2022	4 days	1 days	✓
<b>Aggregate Organics : Mineral Oil &amp; Grease by Gravimetry</b>										
<b>Amber glass (hydrochloric acid)</b> 5210 INNES RD OTTAWA- MW5	E567SG	11-Oct-2022	14-Oct-2022	29 days	3 days	✓	17-Oct-2022	40 days	3 days	✓
<b>Aggregate Organics : Oil &amp; Grease by Gravimetry</b>										
<b>Amber glass (hydrochloric acid)</b> 5210 INNES RD OTTAWA- MW5	E567	11-Oct-2022	14-Oct-2022	29 days	3 days	✓	17-Oct-2022	40 days	3 days	✓
<b>Aggregate Organics : Phenols (4AAP) in Water by Colorimetry</b>										
<b>Amber glass total (sulfuric acid) [ON MECP]</b> 5210 INNES RD OTTAWA- MW5	E562	11-Oct-2022	17-Oct-2022	29 days	7 days	✓	20-Oct-2022	22 days	3 days	✓
<b>Aldehydes : Aldehydes by GC-ECD</b>										
<b>Glass vial (ammonium chloride+copper sulfate)</b> 5210 INNES RD OTTAWA- MW5	E693A	11-Oct-2022	----	----	----		12-Oct-2022	8 days	2 days	✓
<b>Anions and Nutrients : Fluoride in Water by IC</b>										
<b>HDPE [ON MECP]</b> 5210 INNES RD OTTAWA- MW5	E235.F	11-Oct-2022	14-Oct-2022	----	----		17-Oct-2022	28 days	7 days	✓
<b>Anions and Nutrients : Sulfate in Water by IC</b>										
<b>HDPE [ON MECP]</b> 5210 INNES RD OTTAWA- MW5	E235.SO4	11-Oct-2022	14-Oct-2022	----	----		17-Oct-2022	28 days	7 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		
<b>Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)</b>											
<b>Amber glass total (sulfuric acid) [ON MECP]</b> 5210 INNES RD OTTAWA- MW5	E318	11-Oct-2022	17-Oct-2022	----	----		18-Oct-2022	28 days	8 days	✔	
<b>Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)</b>											
<b>Amber glass total (sulfuric acid) [ON MECP]</b> 5210 INNES RD OTTAWA- MW5	E372-U	11-Oct-2022	17-Oct-2022	----	----		18-Oct-2022	28 days	8 days	✔	
<b>Chlorinated Phenolics : BNA (ON 625 list) by GC-MS</b>											
<b>Amber glass/Teflon lined cap [ON MECP]</b> 5210 INNES RD OTTAWA- MW5	E655B	11-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	----	----		
<b>Cyanides : Total Cyanide</b>											
<b>UV-inhibited HDPE - total (sodium hydroxide)</b> 5210 INNES RD OTTAWA- MW5	E333	11-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	3 days	✔	
<b>Microbiological Tests : E. coli (MF-mFC-BCIG)</b>											
<b>Sterile HDPE (Sodium thiosulphate) [ON MECP]</b> 5210 INNES RD OTTAWA- MW5	E012A.EC	11-Oct-2022	----	----	----		12-Oct-2022	48 hrs	33 hrs	✔	
<b>Nitrosamines : Nitrosamines by LC-MS-MS by Direct Injection (Routine Levels)</b>											
<b>Amber glass/Teflon lined cap - LCMS</b> 5210 INNES RD OTTAWA- MW5	E725A	11-Oct-2022	13-Oct-2022	29 days	2 days	✔	24-Oct-2022	28 days	11 days	✔	
<b>Nonylphenols : Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode</b>											
<b>Amber glass/Teflon lined cap - LCMS</b> 5210 INNES RD OTTAWA- MW5	E749B	11-Oct-2022	13-Oct-2022	8 days	3 days	✔	13-Oct-2022	7 days	0 days	✔	
<b>Nonylphenols : Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode</b>											
<b>Amber glass/Teflon lined cap - LCMS</b> 5210 INNES RD OTTAWA- MW5	E749A	11-Oct-2022	13-Oct-2022	8 days	3 days	✔	13-Oct-2022	7 days	0 days	✔	
<b>Organochlorine Pesticides : OCP Analysis by GC-MS-MS</b>											
<b>Amber glass/Teflon lined cap [ON MECP]</b> 5210 INNES RD OTTAWA- MW5	E660F	11-Oct-2022	12-Oct-2022	15 days	1 days	✔	13-Oct-2022	40 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		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Phthalate Esters : BNA (ON 625 list) by GC-MS</b>											
Amber glass/Teflon lined cap [ON MECP] 5210 INNES RD OTTAWA- MW5	E655B	11-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	----	----		
<b>Physical Tests : pH by Meter</b>											
HDPE [ON MECP] 5210 INNES RD OTTAWA- MW5	E108	11-Oct-2022	14-Oct-2022	----	----		15-Oct-2022	14 days	4 days	✔	
<b>Physical Tests : TSS by Gravimetry</b>											
HDPE [ON MECP] 5210 INNES RD OTTAWA- MW5	E160	11-Oct-2022	----	----	----		12-Oct-2022	7 days	1 days	✔	
<b>Polychlorinated Biphenyls : PCB Aroclors by GC-MS</b>											
Amber glass/Teflon lined cap [ON MECP] 5210 INNES RD OTTAWA- MW5	E687	11-Oct-2022	12-Oct-2022	21 days	1 days	✔	13-Oct-2022	40 days	1 days	✔	
<b>Polycyclic Aromatic Hydrocarbons : BNA (ON 625 list) by GC-MS</b>											
Amber glass/Teflon lined cap [ON MECP] 5210 INNES RD OTTAWA- MW5	E655B	11-Oct-2022	18-Oct-2022	----	----		19-Oct-2022	----	----		
<b>Polycyclic Aromatic Hydrocarbons : PAHs (ON Special List) by GC-MS</b>											
Amber glass/Teflon lined cap 5210 INNES RD OTTAWA- MW5	E642D	11-Oct-2022	18-Oct-2022	15 days	8 days	✔	19-Oct-2022	40 days	1 days	✔	
<b>Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS (Low Level)</b>											
Amber glass/Teflon lined cap (sodium bisulfate) 5210 INNES RD OTTAWA- MW5	E641A-L	11-Oct-2022	17-Oct-2022	15 days	6 days	✔	18-Oct-2022	40 days	1 days	✔	
<b>Semi-Volatile Organics : BNA (ON 625 list) by GC-MS</b>											
Amber glass/Teflon lined cap [ON MECP] 5210 INNES RD OTTAWA- MW5	E655B	11-Oct-2022	18-Oct-2022	15 days	8 days	✔	19-Oct-2022	40 days	1 days	✔	
<b>Total Metals : Total Mercury in Water by CVAAS</b>											
Glass vial total (hydrochloric acid) 5210 INNES RD OTTAWA- MW5	E508	11-Oct-2022	12-Oct-2022	----	----		12-Oct-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		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Total Metals : Total metals in Water by CRC ICPMS</b>											
<b>HDPE total (nitric acid)</b> 5210 INNES RD OTTAWA- MW5	E420	11-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	180 days	3 days	✓	
<b>Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)</b>											
<b>HDPE total (zinc acetate+sodium hydroxide)</b> 5210 INNES RD OTTAWA- MW5	E395-H	11-Oct-2022	----	----	----		14-Oct-2022	7 days	4 days	✓	
<b>Volatile Organic Compounds : VOCs (Eastern Canada List) by Headspace GC-MS</b>											
<b>Glass vial (sodium bisulfate)</b> 5210 INNES RD OTTAWA- MW5	E611D	11-Oct-2022	16-Oct-2022	----	----		16-Oct-2022	14 days	6 days	✓	
<b>Volatile Organic Compounds [Fuels] : VOCs (Full List) by Headspace GC-MS</b>											
<b>Glass vial (sodium bisulfate)</b> 5210 INNES RD OTTAWA- MW5	E611F	11-Oct-2022	16-Oct-2022	----	----		16-Oct-2022	14 days	6 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 (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Aldehydes by GC-ECD	E693A	691490	1	4	25.0	5.0	✔
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	691814	1	4	25.0	5.0	✔
E. coli (MF-mFC-BCIG)	E012A.EC	691540	0	17	0.0	5.0	✖
Fluoride in Water by IC	E235.F	697107	1	4	25.0	5.0	✔
Nitrosamines by LC-MS-MS by Direct Injection (Routine Levels)	E725A	691888	1	20	5.0	5.0	✔
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	694391	1	8	12.5	5.0	✔
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	694390	1	8	12.5	5.0	✔
pH by Meter	E108	697112	1	19	5.2	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	698968	1	20	5.0	5.0	✔
Sulfate in Water by IC	E235.SO4	697105	1	9	11.1	5.0	✔
Total Cyanide	E333	694685	1	14	7.1	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	698966	1	18	5.5	5.0	✔
Total Mercury in Water by CVAAS	E508	691389	1	20	5.0	5.0	✔
Total metals in Water by CRC ICPMS	E420	693441	1	20	5.0	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	698969	1	20	5.0	5.0	✔
Total Sulfide by Colourimetry (Automated Flow)	E395-H	696107	1	14	7.1	5.0	✔
TSS by Gravimetry	E160	691026	1	19	5.2	4.7	✔
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	698633	1	2	50.0	5.0	✔
VOCs (Full List) by Headspace GC-MS	E611F	698632	1	3	33.3	5.0	✔
<b>Laboratory Control Samples (LCS)</b>							
Aldehydes by GC-ECD	E693A	691490	1	4	25.0	5.0	✔
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	691814	1	4	25.0	5.0	✔
BNA (ON 625 list) by GC-MS	E655B	701490	1	2	50.0	5.0	✔
Fluoride in Water by IC	E235.F	697107	1	4	25.0	5.0	✔
Mineral Oil & Grease by Gravimetry	E567SG	695645	1	9	11.1	5.0	✔
Nitrosamines by LC-MS-MS by Direct Injection (Routine Levels)	E725A	691888	1	20	5.0	5.0	✔
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	694391	1	8	12.5	5.0	✔
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	694390	1	8	12.5	5.0	✔
OCP Analysis by GC-MS-MS	E660F	691066	1	2	50.0	5.0	✔
Oil & Grease by Gravimetry	E567	695644	1	13	7.6	5.0	✔
PAHs (ON Special List) by GC-MS	E642D	701488	1	2	50.0	5.0	✔
PAHs by Hexane LVI GC-MS (Low Level)	E641A-L	698948	1	4	25.0	5.0	✔
PCB Aroclors by GC-MS	E687	691065	1	19	5.2	4.7	✔
pH by Meter	E108	697112	1	19	5.2	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	698968	1	20	5.0	5.0	✔
Sulfate in Water by IC	E235.SO4	697105	1	9	11.1	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
<b>Analytical Methods</b>							
<b>Laboratory Control Samples (LCS) - Continued</b>							
Total Cyanide	E333	694685	1	14	7.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	698966	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	691389	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	693441	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	698969	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	696107	1	14	7.1	5.0	✓
TSS by Gravimetry	E160	691026	1	19	5.2	4.7	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	698633	1	2	50.0	5.0	✓
VOCs (Full List) by Headspace GC-MS	E611F	698632	1	3	33.3	5.0	✓
<b>Method Blanks (MB)</b>							
Aldehydes by GC-ECD	E693A	691490	1	4	25.0	5.0	✓
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	691814	1	4	25.0	5.0	✓
BNA (ON 625 list) by GC-MS	E655B	701490	1	2	50.0	5.0	✓
E. coli (MF-mFC-BCIG)	E012A.EC	691540	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	697107	1	4	25.0	5.0	✓
Mineral Oil & Grease by Gravimetry	E567SG	695645	1	9	11.1	5.0	✓
Nitrosamines by LC-MS-MS by Direct Injection (Routine Levels)	E725A	691888	1	20	5.0	5.0	✓
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	694391	1	8	12.5	5.0	✓
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	694390	1	8	12.5	5.0	✓
OCP Analysis by GC-MS-MS	E660F	691066	1	2	50.0	5.0	✓
Oil & Grease by Gravimetry	E567	695644	1	13	7.6	5.0	✓
PAHs (ON Special List) by GC-MS	E642D	701488	1	2	50.0	5.0	✓
PAHs by Hexane LVI GC-MS (Low Level)	E641A-L	698948	1	4	25.0	5.0	✓
PCB Aroclors by GC-MS	E687	691065	1	19	5.2	4.7	✓
Phenols (4AAP) in Water by Colorimetry	E562	698968	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	697105	1	9	11.1	5.0	✓
Total Cyanide	E333	694685	1	14	7.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	698966	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	691389	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	693441	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	698969	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	696107	1	14	7.1	5.0	✓
TSS by Gravimetry	E160	691026	1	19	5.2	4.7	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	698633	1	2	50.0	5.0	✓
VOCs (Full List) by Headspace GC-MS	E611F	698632	1	3	33.3	5.0	✓
<b>Matrix Spikes (MS)</b>							
Aldehydes by GC-ECD	E693A	691490	1	4	25.0	5.0	✓
Fluoride in Water by IC	E235.F	697107	1	4	25.0	5.0	✓
Nitrosamines by LC-MS-MS by Direct Injection (Routine Levels)	E725A	691888	1	20	5.0	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
<i>Analytical Methods</i>							
<b>Matrix Spikes (MS) - Continued</b>							
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B	694391	1	8	12.5	5.0	✔
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A	694390	1	8	12.5	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	698968	1	20	5.0	5.0	✔
Sulfate in Water by IC	E235.SO4	697105	1	9	11.1	5.0	✔
Total Cyanide	E333	694685	1	14	7.1	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	698966	1	18	5.5	5.0	✔
Total Mercury in Water by CVAAS	E508	691389	1	20	5.0	5.0	✔
Total metals in Water by CRC ICPMS	E420	693441	1	20	5.0	5.0	✔
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	698969	1	20	5.0	5.0	✔
Total Sulfide by Colourimetry (Automated Flow)	E395-H	696107	1	14	7.1	5.0	✔
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	698633	1	2	50.0	5.0	✔
VOCs (Full List) by Headspace GC-MS	E611F	698632	1	3	33.3	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 Sulfide by Colourimetry (Automated Flow)	E395-H Vancouver - Environmental	Water	APHA 4500 -S E-Auto-Colorimetry	Sulfide is determined using the gas dialysis automated methylene blue colourimetric method. Results expressed "as H2S" if reported represent the maximum possible H2S concentration based on the total sulfide concentration in the sample. The H2S calculation converts Total Sulphide as (S2-) and reports it as Total Sulphide as (H2S)



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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.
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 <sub>3</sub> Fe(CN) <sub>6</sub> ) and 4-amino-antipyrine (4-AAP) to form a red complex which is measured colorimetrically.
Oil & Grease by Gravimetry	E567 Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane and the extract is evaporated to dryness. The residue is then weighed to determine Oil and Grease.
Mineral Oil & Grease by Gravimetry	E567SG Waterloo - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane, followed by silica gel treatment after which the extract is evaporated to dryness. The residue is then weighed to determine Mineral Oil and Grease.
VOCs (Eastern Canada List) by Headspace GC-MS	E611D Waterloo - Environmental	Water	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
VOCs (Full List) by Headspace GC-MS	E611F 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.
PAHs by Hexane LVI GC-MS (Low Level)	E641A-L Waterloo - Environmental	Water	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are analyzed by large volume injection (LVI) GC-MS.
PAHs (ON Special List) by GC-MS	E642D Waterloo - Environmental	Water	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are analyzed by GC-MS.



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
BNA (ON 625 list) by GC-MS	E655B Waterloo - Environmental	Water	EPA 8270E (mod)	BNA are analyzed by GC-MS.
OCP Analysis by GC-MS-MS	E660F Waterloo - Environmental	Water	EPA 8270E (mod)	Pesticides are analyzed by GC-MS-MS
PCB Aroclors by GC-MS	E687 Waterloo - Environmental	Water	EPA 8270E (mod)	PCB Aroclors are analyzed by GC-MS
Aldehydes by GC-ECD	E693A Waterloo - Environmental	Water	EPA METHOD 556.1	This is a gas chromatography method optimized for the determination of aldehydes in water and solid samples. Aldehydes are derivatized with o-(2,3,4,5,6-pentafluorobenzyl) hydroxylamine (PFBHA) to obtain their corresponding pentafluorobenzyl oximes. The oxime derivatives are then extracted from the water with hexane containing pentachloronitrobenzene as internal standard. The hexane extracts are analyzed by gas chromatography with electron capture detection (GC-ECD).
Nitrosamines by LC-MS-MS by Direct Injection (Routine Levels)	E725A Waterloo - Environmental	Water	QWI-ORG/WP239	An aliquot of sample is injected directly using liquid chromatography tandem mass spectrometry.
Nonylphenol, Octylphenol and BPA in Water by LC-MS-MS Negative Mode	E749A Waterloo - Environmental	Water	J. Chrom A849 (1999) p.467-482	An aliquot of 5.0 ± 0.10 mL of filtered sample is spiked with Nonylphenol-D4, Nonylphenol Diethoxylate 13C6, and Bisphenol A 13C12 internal standards and analyzed by LC-MS/MS.
Nonylphenol Ethoxylates in Water by LC-MS-MS Positive Mode	E749B Waterloo - Environmental	Water	J. Chrom A849 (1999) p.467-482	Water samples are filtered and analyzed on LCMS/MS by direct injection.
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)
Total PAH (Ontario Sewer Use Extended List)	EC640A Waterloo - Environmental	Water	Calculation (Sum of the Squares)	Total PAH (Ontario Sewer Use) is the sum of the following PAHs: anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b+j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, phenanthrene, pyrene, benzo(e)pyrene, perylene, 3-methylcholanthrene, 1,3-dinitropyrene, 1,6-dinitropyrene, 1,8-dinitropyrene, 7H-dibenzo(c,g)carbazole, dibenzo(a,i)pyrene, dibenz(a,j)acridine, and dibenz(a,h)acridine. When the PAH is less than LOR, zero is used for calculation.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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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.
PHCs and PAHs Hexane Extraction	EP601 Waterloo - Environmental	Water	EPA 3511 (mod)	Petroleum Hydrocarbons (PHCs) and Polycyclic Aromatic Hydrocarbons (PAHs) are extracted using a hexane liquid-liquid extraction.
PAHs DCM Extraction	EP642 Waterloo - Environmental	Water	EPA 3510C (mod)	PAH are extracted from aqueous sample using DCM liquid-liquid extraction.
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 Nitrosamines for Direct Injection LC-MS-MS	EP725A Waterloo - Environmental	Water	QWI-ORG/WP239	Preparation of Nitrosamines in Water for Direct Injection LC-MS-MS
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

<b>Work Order</b>	<b>: WT2217418</b>	<b>Page</b>	: 1 of 18
<b>Client</b>	: Fisher Environmental Ltd.	<b>Laboratory</b>	: Waterloo - Environmental
<b>Contact</b>	: Clive Wiggan	<b>Account Manager</b>	: Emily Hansen
<b>Address</b>	: 15-400 Esna Park Drive Markham ON Canada L3R 3K2	<b>Address</b>	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
<b>Telephone</b>	:	<b>Telephone</b>	: +1 519 886 6910
<b>Project</b>	: ----	<b>Date Samples Received</b>	: 11-Oct-2022 15:52
<b>PO</b>	: ----	<b>Date Analysis Commenced</b>	: 12-Oct-2022
<b>C-O-C number</b>	: 20-1004260	<b>Issue Date</b>	: 25-Oct-2022 13:50
<b>Sampler</b>	: CLIENT 905 475 7755, Ext. 29		
<b>Site</b>	: ----		
<b>Quote number</b>	: FISHER ENVIRONMENTAL - ALS 2022 STANDING OFFER		
<b>No. of samples received</b>	: 1		
<b>No. of samples analysed</b>	: 1		

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

This Quality Control Report contains the following information:

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

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Adam Boettger	Team Leader - LCMS	Waterloo LCMS, Waterloo, Ontario
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Waterloo Microbiology, Waterloo, Ontario
Caitlin Macey	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Danielle Gravel	Team Leader - Semi-Volatile Instrumentation	Waterloo Organics, Waterloo, Ontario
David Tremblett	Team Leader - Volatiles	Waterloo Air Quality, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario
Jocelyn Kennedy	Department Manager - Semi-Volatile Organics	Waterloo Organics, Waterloo, Ontario
Rachel Cameron	Team Leader - Semi-Volatile Organics	Waterloo Organics, Waterloo, Ontario
Sarah Birch	Team Leader - Volatiles	Waterloo Organics, Waterloo, Ontario



Page : 2 of 18  
Work Order : WT2217418  
Client : Fisher Environmental Ltd.  
Project : ----



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## 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

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

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### 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: <b>Water</b>					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
<b>Physical Tests (QC Lot: 691026)</b>											
WT2217165-001	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	89.6	85.4	4.80%	20%	----
<b>Physical Tests (QC Lot: 697112)</b>											
WT2217293-001	Anonymous	pH	----	E108	0.10	pH units	8.73	8.75	0.229%	4%	----
<b>Anions and Nutrients (QC Lot: 697105)</b>											
WT2217203-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	78.5	77.8	0.892%	20%	----
<b>Anions and Nutrients (QC Lot: 697107)</b>											
WT2217203-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.658	0.639	2.92%	20%	----
<b>Anions and Nutrients (QC Lot: 698966)</b>											
WT2217371-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.500	mg/L	<0.500	<0.500	0	Diff <2x LOR	----
<b>Anions and Nutrients (QC Lot: 698969)</b>											
WT2217206-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.286	0.282	1.26%	20%	----
<b>Cyanides (QC Lot: 694685)</b>											
TY2202609-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
<b>Total Sulfides (QC Lot: 696107)</b>											
VA22C4619-001	Anonymous	sulfide, total (as S)	18496-25-8	E395-H	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 691389)</b>											
TY2202462-007	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
<b>Total Metals (QC Lot: 693441)</b>											
WT2217303-001	Anonymous	aluminum, total	7429-90-5	E420	0.0300	mg/L	<0.0300	<0.0300	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000500	mg/L	<0.0000500	<0.0000500	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00100	mg/L	<0.00090	<0.00100	0.00010	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00500	mg/L	<0.00100	<0.00500	0.00400	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		manganese, total	7439-96-5	E420	0.00100	mg/L	0.0197	0.0182	7.82%	20%	----



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
<b>Total Metals (QC Lot: 693441) - continued</b>											
WT2217303-001	Anonymous	molybdenum, total	7439-98-7	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00300	mg/L	<0.00300	<0.00300	0	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0300	mg/L	<0.0300	<0.0300	0	Diff <2x LOR	----
<b>Aggregate Organics (QC Lot: 691814)</b>											
WT2217468-001	Anonymous	carbonaceous biochemical oxygen demand [CBOD]	----	E555	2.0	mg/L	5.4	5.4	0.0%	30%	----
<b>Aggregate Organics (QC Lot: 698968)</b>											
WT2217206-001	Anonymous	phenols, total (4AAP)	----	E562	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
<b>Volatile Organic Compounds (QC Lot: 698632)</b>											
WT2217371-001	Anonymous	trimethylbenzene, 1,3,5-	108-67-8	E611F	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
<b>Volatile Organic Compounds (QC Lot: 698633)</b>											
WT2217371-001	Anonymous	benzene	71-43-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		bromodichloromethane	75-27-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		bromoform	75-25-2	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		bromomethane	74-83-9	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		carbon tetrachloride	56-23-5	E611D	0.20	µg/L	<0.20	<0.20	0	Diff <2x LOR	----
		chlorobenzene	108-90-7	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		chloroethane	75-00-3	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	----
		chloromethane	74-87-3	E611D	2.0	µg/L	<2.0	<2.0	0	Diff <2x LOR	----
		dibromochloromethane	124-48-1	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dibromoethane, 1,2-	106-93-4	E611D	0.20	µg/L	<0.20	<0.20	0	Diff <2x LOR	----
		dichlorobenzene, 1,2-	95-50-1	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		dichlorobenzene, 1,3-	541-73-1	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	----



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
<b>Volatile Organic Compounds (QC Lot: 698633) - continued</b>											
WT2217371-001	Anonymous	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	----
		trichlorofluoromethane	75-69-4	E611D	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		vinyl chloride	75-01-4	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	<0.30	0	Diff <2x LOR	----	
<b>Aldehydes (QC Lot: 691490)</b>											
WT2217371-001	Anonymous	Formaldehyde	50-00-0	E693A	2.0	µg/L	<2.0	<2.0	0	Diff <2x LOR	----
<b>Nonylphenols (QC Lot: 694390)</b>											
WT2217371-001	Anonymous	nonylphenols [NP]	84852-15-3	E749A	1.0	µg/L	<1.0	<1.0	0	Diff <2x LOR	----
<b>Nonylphenols (QC Lot: 694391)</b>											
WT2217371-001	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	----
<b>Nitrosamines (QC Lot: 691888)</b>											
WT2216975-001	Anonymous	nitrosodimethylamine, n- [NDMA]	62-75-9	E725A	0.030	µg/L	0.043	0.046	0.002	Diff <2x LOR	----



## Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 691026)</b>						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
<b>Anions and Nutrients (QCLot: 697105)</b>						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
<b>Anions and Nutrients (QCLot: 697107)</b>						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
<b>Anions and Nutrients (QCLot: 698966)</b>						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
<b>Anions and Nutrients (QCLot: 698969)</b>						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
<b>Cyanides (QCLot: 694685)</b>						
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	<0.0020	----
<b>Total Sulfides (QCLot: 696107)</b>						
sulfide, total (as S)	18496-25-8	E395-H	0.01	mg/L	<0.010	----
<b>Microbiological Tests (QCLot: 691540)</b>						
coliforms, Escherichia coli [E. coli]	----	E012A.EC	1	CFU/100mL	<1	----
<b>Total Metals (QCLot: 691389)</b>						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
<b>Total Metals (QCLot: 693441)</b>						
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	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
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	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Total Metals (QCLot: 693441) - continued</b>						
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	---
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	---
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	---
<b>Aggregate Organics (QCLot: 691814)</b>						
carbonaceous biochemical oxygen demand [CBOD]	---	E555	2	mg/L	<2.0	---
<b>Aggregate Organics (QCLot: 695644)</b>						
oil & grease (gravimetric)	---	E567	5	mg/L	<5.0	---
<b>Aggregate Organics (QCLot: 695645)</b>						
oil & grease, mineral (gravimetric)	---	E567SG	5	mg/L	<5.0	---
<b>Aggregate Organics (QCLot: 698968)</b>						
phenols, total (4AAP)	---	E562	0.001	mg/L	<0.0010	---
<b>Volatile Organic Compounds (QCLot: 698632)</b>						
trimethylbenzene, 1,3,5-	108-67-8	E611F	0.5	µg/L	<0.50	---
<b>Volatile Organic Compounds (QCLot: 698633)</b>						
benzene	71-43-2	E611D	0.5	µg/L	<0.50	---
bromodichloromethane	75-27-4	E611D	0.5	µg/L	<0.50	---
bromoform	75-25-2	E611D	0.5	µg/L	<0.50	---
bromomethane	74-83-9	E611D	0.5	µg/L	<0.50	---
carbon tetrachloride	56-23-5	E611D	0.2	µg/L	<0.20	---
chlorobenzene	108-90-7	E611D	0.5	µg/L	<0.50	---
chloroethane	75-00-3	E611D	0.5	µg/L	<0.50	---
chloroform	67-66-3	E611D	0.5	µg/L	<0.50	---
chloromethane	74-87-3	E611D	2	µg/L	<2.0	---
dibromochloromethane	124-48-1	E611D	0.5	µg/L	<0.50	---
dibromoethane, 1,2-	106-93-4	E611D	0.2	µg/L	<0.20	---
dichlorobenzene, 1,2-	95-50-1	E611D	0.5	µg/L	<0.50	---
dichlorobenzene, 1,3-	541-73-1	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	---
tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.5	µg/L	<0.50	---



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Volatile Organic Compounds (QCLot: 698633) - continued</b>						
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	---
trichlorofluoromethane	75-69-4	E611D	0.5	µg/L	<0.50	---
vinyl chloride	75-01-4	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	---
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 698948)</b>						
anthracene	120-12-7	E641A-L	0.01	µg/L	<0.010	---
benz(a)anthracene	56-55-3	E641A-L	0.01	µg/L	<0.010	---
benzo(a)pyrene	50-32-8	E641A-L	0.005	µg/L	<0.0050	---
benzo(b+j)fluoranthene	n/a	E641A-L	0.01	µg/L	<0.010	---
benzo(e)pyrene	192-97-2	E641A-L	0.01	µg/L	<0.010	---
benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	µg/L	<0.010	---
benzo(k)fluoranthene	207-08-9	E641A-L	0.01	µg/L	<0.010	---
chrysene	218-01-9	E641A-L	0.01	µg/L	<0.010	---
dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	µg/L	<0.0050	---
fluoranthene	206-44-0	E641A-L	0.01	µg/L	<0.010	---
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	µg/L	<0.010	---
perylene	198-55-0	E641A-L	0.01	µg/L	<0.010	---
phenanthrene	85-01-8	E641A-L	0.01	µg/L	<0.010	---
pyrene	129-00-0	E641A-L	0.01	µg/L	<0.010	---
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 701488)</b>						
dibenz(a,h)acridine	226-36-8	E642D	0.05	µg/L	<0.050	---
dibenz(a,j)acridine	224-42-0	E642D	0.05	µg/L	<0.050	---
dibenzo(a,i)pyrene	189-55-9	E642D	0.05	µg/L	<0.050	---
dibenzo(c,g)carbazole, 7H-	194-59-2	E642D	0.05	µg/L	<0.050	---
dinitropyrene, 1,3-	75321-20-9	E642D	1	µg/L	<1.0	---
dinitropyrene, 1,6-	42397-64-8	E642D	1	µg/L	<1.0	---
dinitropyrene, 1,8-	42397-65-9	E642D	1	µg/L	<1.0	---
methylcholanthrene, 3-	56-49-5	E642D	0.05	µg/L	<0.050	---
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 701490)</b>						
fluorene	86-73-7	E655B	0.2	µg/L	<0.20	---
methylnaphthalene, 1-	90-12-0	E655B	0.4	µg/L	<0.40	---
methylnaphthalene, 2-	91-57-6	E655B	0.4	µg/L	<0.40	---



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 701490) - continued</b>						
naphthalene	91-20-3	E655B	0.2	µg/L	<0.20	---
<b>Aldehydes (QCLot: 691490)</b>						
Formaldehyde	50-00-0	E693A	2	µg/L	<2.0	---
<b>Phthalate Esters (QCLot: 701490)</b>						
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	E655B	1	µg/L	<1.0	---
butyl benzyl phthalate	85-68-7	E655B	0.4	µg/L	<0.40	---
diethyl phthalate	84-66-2	E655B	0.2	µg/L	<0.20	---
di-n-butyl phthalate	84-74-2	E655B	1	µg/L	<1.0	---
di-n-octyl phthalate [DNOP]	117-84-0	E655B	0.4	µg/L	<0.40	---
<b>Semi-Volatile Organics (QCLot: 701490)</b>						
bis(2-chloroethoxy)methane	111-91-1	E655B	0.4	µg/L	<0.40	---
indole	120-72-9	E655B	0.4	µg/L	<0.40	---
<b>Chlorinated Phenolics (QCLot: 701490)</b>						
dichlorophenol, 2,4-	120-83-2	E655B	0.3	µg/L	<0.30	---
<b>Nonylphenols (QCLot: 694390)</b>						
nonylphenols [NP]	84852-15-3	E749A	1	µg/L	<1.0	---
<b>Nonylphenols (QCLot: 694391)</b>						
nonylphenol diethoxylates [NP2EO]	n/a	E749B	0.1	µg/L	<0.10	---
nonylphenol monoethoxylates [NP1EO]	n/a	E749B	2	µg/L	<2.0	---
<b>Polychlorinated Biphenyls (QCLot: 691065)</b>						
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	---
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	---
<b>Organochlorine Pesticides (QCLot: 691066)</b>						
hexachlorobenzene	118-74-1	E660F	0.008	µg/L	<0.0080	---
<b>Nitrosamines (QCLot: 691888)</b>						
nitrosodimethylamine, n- [NDMA]	62-75-9	E725A	0.03	µg/L	<0.030	---



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Work Order : WT2217418  
Client : Fisher Environmental Ltd.  
Project : ---

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## 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				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Physical Tests (QCLot: 691026)</b>									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	89.0	85.0	115	----
<b>Physical Tests (QCLot: 697112)</b>									
pH	----	E108	----	pH units	7 pH units	101	98.0	102	----
<b>Anions and Nutrients (QCLot: 697105)</b>									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
<b>Anions and Nutrients (QCLot: 697107)</b>									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	100	90.0	110	----
<b>Anions and Nutrients (QCLot: 698966)</b>									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	104	75.0	125	----
<b>Anions and Nutrients (QCLot: 698969)</b>									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.53 mg/L	97.5	80.0	120	----
<b>Cyanides (QCLot: 694685)</b>									
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	0.25 mg/L	89.4	80.0	120	----
<b>Total Sulfides (QCLot: 696107)</b>									
sulfide, total (as H2S)	7783-06-4	E395-H	----	mg/L	0.085 mg/L	80.1	80.0	120	----
sulfide, total (as S)	18496-25-8	E395-H	0.01	mg/L	0.08 mg/L	80.0	80.0	120	----
<b>Total Metals (QCLot: 691389)</b>									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	101	80.0	120	----
<b>Total Metals (QCLot: 693441)</b>									
aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	99.1	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	108	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	104	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	0.05 mg/L	104	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	0.05 mg/L	87.8	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	108	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	101	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	101	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	99.2	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	106	80.0	120	----



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Total Metals (QCLot: 693441) - continued</b>									
manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	103	80.0	120	---
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	100	80.0	120	---
nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	101	80.0	120	---
selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	104	80.0	120	---
silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	106	80.0	120	---
tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	106	80.0	120	---
titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	99.2	80.0	120	---
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.025 mg/L	102	80.0	120	---
zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	101	80.0	120	---
<b>Aggregate Organics (QCLot: 691814)</b>									
carbonaceous biochemical oxygen demand [CBOD]	---	E555	2	mg/L	198 mg/L	103	85.0	115	---
<b>Aggregate Organics (QCLot: 695644)</b>									
oil & grease (gravimetric)	---	E567	5	mg/L	200 mg/L	91.4	70.0	130	---
<b>Aggregate Organics (QCLot: 695645)</b>									
oil & grease, mineral (gravimetric)	---	E567SG	5	mg/L	100 mg/L	88.2	70.0	130	---
<b>Aggregate Organics (QCLot: 698968)</b>									
phenols, total (4AAP)	---	E562	0.001	mg/L	0.02 mg/L	106	85.0	115	---
<b>Volatile Organic Compounds (QCLot: 698632)</b>									
trimethylbenzene, 1,3,5-	108-67-8	E611F	0.5	µg/L	100 µg/L	114	70.0	130	---
<b>Volatile Organic Compounds (QCLot: 698633)</b>									
benzene	71-43-2	E611D	0.5	µg/L	100 µg/L	113	70.0	130	---
bromodichloromethane	75-27-4	E611D	0.5	µg/L	100 µg/L	116	70.0	130	---
bromoform	75-25-2	E611D	0.5	µg/L	100 µg/L	100	70.0	130	---
bromomethane	74-83-9	E611D	0.5	µg/L	100 µg/L	103	60.0	140	---
carbon tetrachloride	56-23-5	E611D	0.2	µg/L	100 µg/L	115	70.0	130	---
chlorobenzene	108-90-7	E611D	0.5	µg/L	100 µg/L	111	70.0	130	---
chloroethane	75-00-3	E611D	0.5	µg/L	100 µg/L	108	60.0	140	---
chloroform	67-66-3	E611D	0.5	µg/L	100 µg/L	111	70.0	130	---
chloromethane	74-87-3	E611D	2	µg/L	100 µg/L	92.6	60.0	140	---
dibromochloromethane	124-48-1	E611D	0.5	µg/L	100 µg/L	100	70.0	130	---
dibromoethane, 1,2-	106-93-4	E611D	0.2	µg/L	100 µg/L	91.3	70.0	130	---
dichlorobenzene, 1,2-	95-50-1	E611D	0.5	µg/L	100 µg/L	110	70.0	130	---
dichlorobenzene, 1,3-	541-73-1	E611D	0.5	µg/L	100 µg/L	111	70.0	130	---
dichlorobenzene, 1,4-	106-46-7	E611D	0.5	µg/L	100 µg/L	110	70.0	130	---



Sub-Matrix: Water

Laboratory Control Sample (LCS) Report

Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
<b>Volatile Organic Compounds (QCLot: 698633) - continued</b>									
dichloroethylene, cis-1,2-	156-59-2	E611D	0.5	µg/L	100 µg/L	95.9	70.0	130	---
dichloromethane	75-09-2	E611D	1	µg/L	100 µg/L	118	70.0	130	---
dichloropropylene, trans-1,3-	10061-02-6	E611D	0.3	µg/L	100 µg/L	90.1	70.0	130	---
ethylbenzene	100-41-4	E611D	0.5	µg/L	100 µg/L	106	70.0	130	---
tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.5	µg/L	100 µg/L	103	70.0	130	---
tetrachloroethylene	127-18-4	E611D	0.5	µg/L	100 µg/L	106	70.0	130	---
toluene	108-88-3	E611D	0.5	µg/L	100 µg/L	106	70.0	130	---
trichloroethylene	79-01-6	E611D	0.5	µg/L	100 µg/L	114	70.0	130	---
trichlorofluoromethane	75-69-4	E611D	0.5	µg/L	100 µg/L	109	60.0	140	---
vinyl chloride	75-01-4	E611D	0.5	µg/L	100 µg/L	94.4	60.0	140	---
xylene, m+p-	179601-23-1	E611D	0.4	µg/L	200 µg/L	110	70.0	130	---
xylene, o-	95-47-6	E611D	0.3	µg/L	100 µg/L	108	70.0	130	---
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 698948)</b>									
anthracene	120-12-7	E641A-L	0.01	µg/L	0.5263 µg/L	114	50.0	140	---
benz(a)anthracene	56-55-3	E641A-L	0.01	µg/L	0.5263 µg/L	115	50.0	140	---
benzo(a)pyrene	50-32-8	E641A-L	0.005	µg/L	0.5263 µg/L	92.8	50.0	140	---
benzo(b+j)fluoranthene	n/a	E641A-L	0.01	µg/L	0.5263 µg/L	93.7	50.0	140	---
benzo(e)pyrene	192-97-2	E641A-L	0.01	µg/L	0.5263 µg/L	101	50.0	140	---
benzo(g,h,i)perylene	191-24-2	E641A-L	0.01	µg/L	0.5263 µg/L	110	50.0	140	---
benzo(k)fluoranthene	207-08-9	E641A-L	0.01	µg/L	0.5263 µg/L	111	50.0	140	---
chrysene	218-01-9	E641A-L	0.01	µg/L	0.5263 µg/L	110	50.0	140	---
dibenz(a,h)anthracene	53-70-3	E641A-L	0.005	µg/L	0.5263 µg/L	89.3	50.0	140	---
fluoranthene	206-44-0	E641A-L	0.01	µg/L	0.5263 µg/L	116	50.0	140	---
indeno(1,2,3-c,d)pyrene	193-39-5	E641A-L	0.01	µg/L	0.5263 µg/L	89.5	50.0	140	---
perylene	198-55-0	E641A-L	0.01	µg/L	0.5263 µg/L	110	50.0	140	---
phenanthrene	85-01-8	E641A-L	0.01	µg/L	0.5263 µg/L	123	50.0	140	---
pyrene	129-00-0	E641A-L	0.01	µg/L	0.5263 µg/L	115	50.0	140	---
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 701488)</b>									
dibenz(a,h)acridine	226-36-8	E642D	0.05	µg/L	1.6 µg/L	88.2	60.0	130	---
dibenz(a,j)acridine	224-42-0	E642D	0.05	µg/L	1.6 µg/L	87.2	60.0	130	---
dibenzo(a,i)pyrene	189-55-9	E642D	0.05	µg/L	1.6 µg/L	# 59.0	60.0	130	LCS-ND
dibenzo(c,g)carbazole, 7H-	194-59-2	E642D	0.05	µg/L	1.6 µg/L	88.9	60.0	130	---
dinitropyrene, 1,3-	75321-20-9	E642D	1	µg/L	1.6 µg/L	96.7	60.0	130	---
dinitropyrene, 1,6-	42397-64-8	E642D	1	µg/L	1.6 µg/L	106	60.0	130	---
dinitropyrene, 1,8-	42397-65-9	E642D	1	µg/L	1.6 µg/L	119	60.0	130	---



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 701488) - continued</b>									
methylcholanthrene, 3-	56-49-5	E642D	0.05	µg/L	1.6 µg/L	109	60.0	130	----
<b>Polycyclic Aromatic Hydrocarbons (QCLot: 701490)</b>									
fluorene	86-73-7	E655B	0.2	µg/L	1.6 µg/L	97.4	50.0	140	----
methylnaphthalene, 1-	90-12-0	E655B	0.4	µg/L	1.6 µg/L	84.9	50.0	140	----
methylnaphthalene, 2-	91-57-6	E655B	0.4	µg/L	1.6 µg/L	88.5	50.0	140	----
naphthalene	91-20-3	E655B	0.2	µg/L	1.6 µg/L	99.0	50.0	140	----
<b>Aldehydes (QCLot: 691490)</b>									
Formaldehyde	50-00-0	E693A	2	µg/L	25.75 µg/L	103	70.0	130	----
<b>Phthalate Esters (QCLot: 701490)</b>									
bis(2-ethylhexyl) phthalate [DEHP]	117-81-7	E655B	1	µg/L	6.4 µg/L	130	50.0	140	----
butyl benzyl phthalate	85-68-7	E655B	0.4	µg/L	6.4 µg/L	131	50.0	140	----
diethyl phthalate	84-66-2	E655B	0.2	µg/L	6.4 µg/L	105	50.0	140	----
di-n-butyl phthalate	84-74-2	E655B	1	µg/L	6.4 µg/L	117	50.0	140	----
di-n-octyl phthalate [DNOP]	117-84-0	E655B	0.4	µg/L	6.4 µg/L	# 152	50.0	140	LCS-H
<b>Semi-Volatile Organics (QCLot: 701490)</b>									
bis(2-chloroethoxy)methane	111-91-1	E655B	0.4	µg/L	1.6 µg/L	92.2	50.0	140	----
indole	120-72-9	E655B	0.4	µg/L	1.6 µg/L	105	50.0	140	----
<b>Chlorinated Phenolics (QCLot: 701490)</b>									
dichlorophenol, 2,4-	120-83-2	E655B	0.3	µg/L	4.8 µg/L	92.6	65.0	130	----
<b>Nonylphenols (QCLot: 694390)</b>									
nonylphenols [NP]	84852-15-3	E749A	1	µg/L	10 µg/L	96.6	75.0	125	----
<b>Nonylphenols (QCLot: 694391)</b>									
nonylphenol diethoxylates [NP2EO]	n/a	E749B	0.1	µg/L	1 µg/L	102	75.0	125	----
nonylphenol monoethoxylates [NP1EO]	n/a	E749B	2	µg/L	20 µg/L	103	75.0	125	----
<b>Polychlorinated Biphenyls (QCLot: 691065)</b>									
Aroclor 1016	12674-11-2	E687	0.02	µg/L	0.2 µg/L	99.4	60.0	140	----
Aroclor 1221	11104-28-2	E687	0.02	µg/L	0.2 µg/L	99.4	60.0	140	----
Aroclor 1232	11141-16-5	E687	0.02	µg/L	0.2 µg/L	99.4	60.0	140	----
Aroclor 1242	53469-21-9	E687	0.02	µg/L	0.2 µg/L	99.4	60.0	140	----
Aroclor 1248	12672-29-6	E687	0.02	µg/L	0.2 µg/L	97.3	60.0	140	----



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
<b>Polychlorinated Biphenyls (QCLot: 691065) - continued</b>									
Aroclor 1254	11097-69-1	E687	0.02	µg/L	0.2 µg/L	93.2	60.0	140	----
Aroclor 1260	11096-82-5	E687	0.02	µg/L	0.2 µg/L	94.6	60.0	140	----
Aroclor 1262	37324-23-5	E687	0.02	µg/L	0.2 µg/L	94.6	60.0	140	----
Aroclor 1268	11100-14-4	E687	0.02	µg/L	0.2 µg/L	94.6	60.0	140	----
<b>Organochlorine Pesticides (QCLot: 691066)</b>									
hexachlorobenzene	118-74-1	E660F	0.008	µg/L	0.2 µg/L	106	50.0	150	----
<b>Nitrosamines (QCLot: 691888)</b>									
nitrosodimethylamine, n- [NDMA]	62-75-9	E725A	0.03	µg/L	0.25 µg/L	104	50.0	150	----

**Qualifiers**

Qualifier	Description
LCS-H	Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
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 >= 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
<b>Anions and Nutrients (QCLot: 697105)</b>										
WT2217203-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	98.7 mg/L	100 mg/L	98.7	75.0	125	----
<b>Anions and Nutrients (QCLot: 697107)</b>										
WT2217203-001	Anonymous	fluoride	16984-48-8	E235.F	0.990 mg/L	1 mg/L	99.0	75.0	125	----
<b>Anions and Nutrients (QCLot: 698966)</b>										
WT2217371-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	26.9 mg/L	2.5 mg/L	108	70.0	130	----
<b>Anions and Nutrients (QCLot: 698969)</b>										
WT2217206-001	Anonymous	phosphorus, total	7723-14-0	E372-U	ND mg/L	0.1 mg/L	ND	70.0	130	----
<b>Cyanides (QCLot: 694685)</b>										
TY2202609-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.216 mg/L	0.25 mg/L	86.5	75.0	125	----
<b>Total Sulfides (QCLot: 696107)</b>										
VA22C4657-004	Anonymous	sulfide, total (as S)	18496-25-8	E395-H	0.089 mg/L	0.1 mg/L	88.7	75.0	125	----
<b>Total Metals (QCLot: 691389)</b>										
TY2202462-008	Anonymous	mercury, total	7439-97-6	E508	0.0000994 mg/L	0.0001 mg/L	99.4	70.0	130	----
<b>Total Metals (QCLot: 693441)</b>										
WT2217319-001	Anonymous	aluminum, total	7429-90-5	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		antimony, total	7440-36-0	E420	0.0514 mg/L	0.05 mg/L	103	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0509 mg/L	0.05 mg/L	102	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0493 mg/L	0.05 mg/L	98.6	70.0	130	----
		boron, total	7440-42-8	E420	0.048 mg/L	0.05 mg/L	95.1	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00507 mg/L	0.005 mg/L	101	70.0	130	----
		chromium, total	7440-47-3	E420	0.0123 mg/L	0.0125 mg/L	98.7	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0125 mg/L	0.0125 mg/L	100	70.0	130	----
		copper, total	7440-50-8	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		lead, total	7439-92-1	E420	0.0250 mg/L	0.025 mg/L	99.9	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0123 mg/L	0.0125 mg/L	98.7	70.0	130	----
		nickel, total	7440-02-0	E420	0.0246 mg/L	0.025 mg/L	98.3	70.0	130	----
		selenium, total	7782-49-2	E420	0.0514 mg/L	0.05 mg/L	103	70.0	130	----
		silver, total	7440-22-4	E420	0.00520 mg/L	0.005 mg/L	104	70.0	130	----



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
<b>Total Metals (QCLot: 693441) - continued</b>										
WT2217319-001	Anonymous	tin, total	7440-31-5	E420	0.0249 mg/L	0.025 mg/L	99.6	70.0	130	----
		titanium, total	7440-32-6	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0253 mg/L	0.025 mg/L	101	70.0	130	----
		zinc, total	7440-66-6	E420	ND mg/L	0.025 mg/L	ND	70.0	130	----
<b>Aggregate Organics (QCLot: 698968)</b>										
WT2217206-001	Anonymous	phenols, total (4AAP)	----	E562	0.0205 mg/L	0.02 mg/L	102	75.0	125	----
<b>Volatile Organic Compounds (QCLot: 698632)</b>										
WT2217371-001	Anonymous	trimethylbenzene, 1,3,5-	108-67-8	E611F	97.7 µg/L	100 µg/L	97.7	60.0	140	----
<b>Volatile Organic Compounds (QCLot: 698633)</b>										
WT2217371-001	Anonymous	benzene	71-43-2	E611D	100 µg/L	100 µg/L	100	60.0	140	----
		bromodichloromethane	75-27-4	E611D	103 µg/L	100 µg/L	103	60.0	140	----
		bromoform	75-25-2	E611D	88.4 µg/L	100 µg/L	88.4	60.0	140	----
		bromomethane	74-83-9	E611D	84.6 µg/L	100 µg/L	84.6	60.0	140	----
		carbon tetrachloride	56-23-5	E611D	99.0 µg/L	100 µg/L	99.0	60.0	140	----
		chlorobenzene	108-90-7	E611D	97.6 µg/L	100 µg/L	97.6	60.0	140	----
		chloroethane	75-00-3	E611D	93.9 µg/L	100 µg/L	93.9	60.0	140	----
		chloroform	67-66-3	E611D	97.9 µg/L	100 µg/L	97.9	60.0	140	----
		chloromethane	74-87-3	E611D	81.5 µg/L	100 µg/L	81.5	60.0	140	----
		dibromochloromethane	124-48-1	E611D	88.7 µg/L	100 µg/L	88.7	60.0	140	----
		dibromoethane, 1,2-	106-93-4	E611D	80.2 µg/L	100 µg/L	80.2	60.0	140	----
		dichlorobenzene, 1,2-	95-50-1	E611D	99.3 µg/L	100 µg/L	99.3	60.0	140	----
		dichlorobenzene, 1,3-	541-73-1	E611D	101 µg/L	100 µg/L	101	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	83.7 µg/L	100 µg/L	83.7	60.0	140	----
		dichloromethane	75-09-2	E611D	106 µg/L	100 µg/L	106	60.0	140	----
		dichloropropylene, trans-1,3-	10061-02-6	E611D	75.2 µg/L	100 µg/L	75.2	60.0	140	----
		ethylbenzene	100-41-4	E611D	92.1 µg/L	100 µg/L	92.1	60.0	140	----
		tetrachloroethane, 1,1,2,2-	79-34-5	E611D	93.4 µg/L	100 µg/L	93.4	60.0	140	----
		tetrachloroethylene	127-18-4	E611D	90.6 µg/L	100 µg/L	90.6	60.0	140	----
		toluene	108-88-3	E611D	92.2 µg/L	100 µg/L	92.2	60.0	140	----
		trichloroethylene	79-01-6	E611D	97.2 µg/L	100 µg/L	97.2	60.0	140	----
		trichlorofluoromethane	75-69-4	E611D	92.1 µg/L	100 µg/L	92.1	60.0	140	----
		vinyl chloride	75-01-4	E611D	80.4 µg/L	100 µg/L	80.4	60.0	140	----
		xylene, m+p-	179601-23-1	E611D	191 µg/L	200 µg/L	95.7	60.0	140	----





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
<b>Volatile Organic Compounds (QCLot: 698633) - continued</b>										
WT2217371-001	Anonymous	xylene, o-	95-47-6	E611D	95.0 µg/L	100 µg/L	95.0	60.0	140	----
<b>Aldehydes (QCLot: 691490)</b>										
WT2217418-001	5210 INNES RD OTTAWA-MW5	Formaldehyde	50-00-0	E693A	27.4 µg/L	25.75 µg/L	107	50.0	150	----
<b>Nonylphenols (QCLot: 694390)</b>										
WT2217371-001	Anonymous	nonylphenols [NP]	84852-15-3	E749A	11.0 µg/L	10 µg/L	110	60.0	140	----
<b>Nonylphenols (QCLot: 694391)</b>										
WT2217371-001	Anonymous	nonylphenol diethoxylates [NP2EO]	n/a	E749B	0.97 µg/L	1 µg/L	96.9	60.0	140	----
		nonylphenol monoethoxylates [NP1EO]	n/a	E749B	12.2 µg/L	20 µg/L	60.8	60.0	140	----
<b>Nitrosamines (QCLot: 691888)</b>										
WT2216975-001	Anonymous	nitrosodimethylamine, n- [NDMA]	62-75-9	E725A	0.272 µg/L	0.25 µg/L	109	50.0	150	----



## **APPENDIX E – HYDRAULIC CONDUCTIVITY ANALYSES**



**Location:** 5210 Innes Road, Ottawa  
**Project:** FE-P-22-12470H  
**Test Date:** 10/6/2022  
**Tested by:** CAW  
**Well No.** MW101

**Equilibrium Water level (from top of pipe) HE** 268 cm  
**Initial Water level (from top of pipe) Ho** 511 cm  
**Monitoring well inner Dia D** 0.05 m  
**Initial Time offset To** 1 second  
**Reverse of Luthin's reference system Ru = Ho - HE** 243.00 cm  
**Slope of Log((ho-he)/(ht-he)) / T** 4.00E-05  
**G = Ru / (HT - HE)**

**Hydraulic conductivity computed k =** 0.0000605 cm/s  
 6.05E-07 m/s  
 0.052 m/day

Time (Interval s)	HT (Water Drop)			G	LOG (G)
	(Elapsed s)	( m )	( cm )		
	0	5.11			
10	10	5.090	509.0	1.00830	0.00359
10	20	5.080	508.0	1.01250	0.00540
10	30	5.075	507.5	1.01461	0.00630
10	40	5.065	506.5	1.01887	0.00812
10	50	5.060	506.0	1.02101	0.00903
10	60	5.060	506.0	1.02101	0.00903
30	90	5.060	506.0	1.02101	0.00903
30	120	5.060	506.0	1.02101	0.00903
30	150	5.060	506.0	1.02101	0.00903
30	180	5.055	505.5	1.02316	0.00994
30	210	5.045	504.5	1.02748	0.01178
30	240	5.035	503.5	1.03185	0.01362
30	270	5.030	503.0	1.03404	0.01454
30	300	5.025	502.5	1.03625	0.01546
30	330	5.020	502.0	1.03846	0.01639
30	360	5.000	500.0	1.04741	0.02012
300	660	4.955	495.5	1.06813	0.02862
300	960	4.900	490.0	1.09459	0.03925
300	1260	4.830	483.0	1.13023	0.05317
300	1560	4.770	477.0	1.16268	0.06546
300	1860	4.720	472.0	1.19118	0.07598
1800	3660	4.670	467.0	1.22111	0.08675
1800	5460	4.340	434.0	1.46386	0.16550

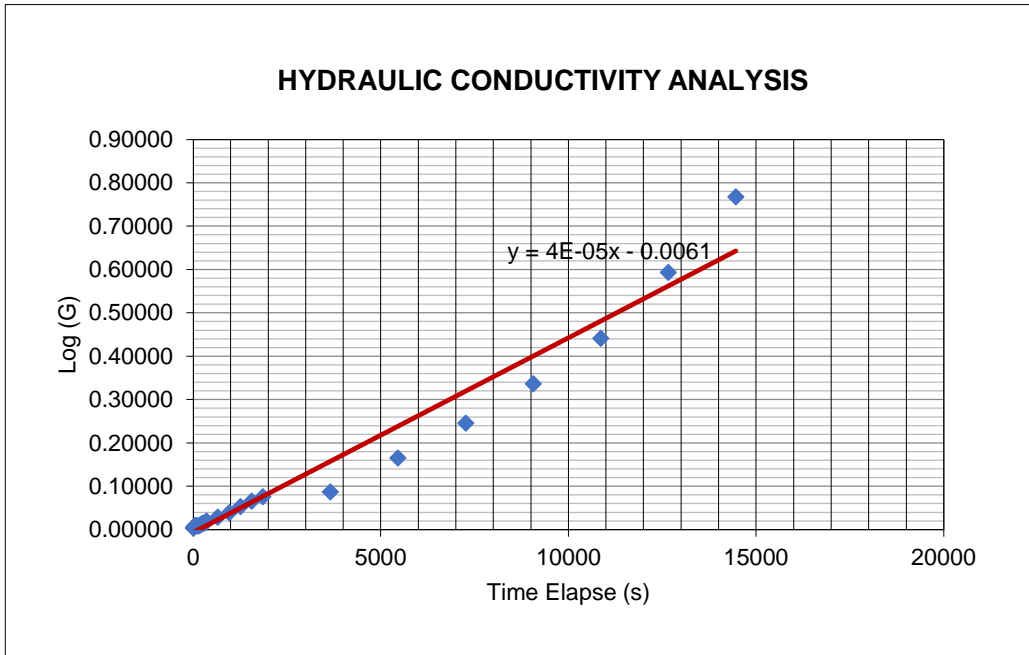
**Location:** 5210 Innes Road, Ottawa

**Project:** FE-P-22-12470H

**Test Date:** 10/6/2022

**Tested by:** CAW

**Well No.:** MW101



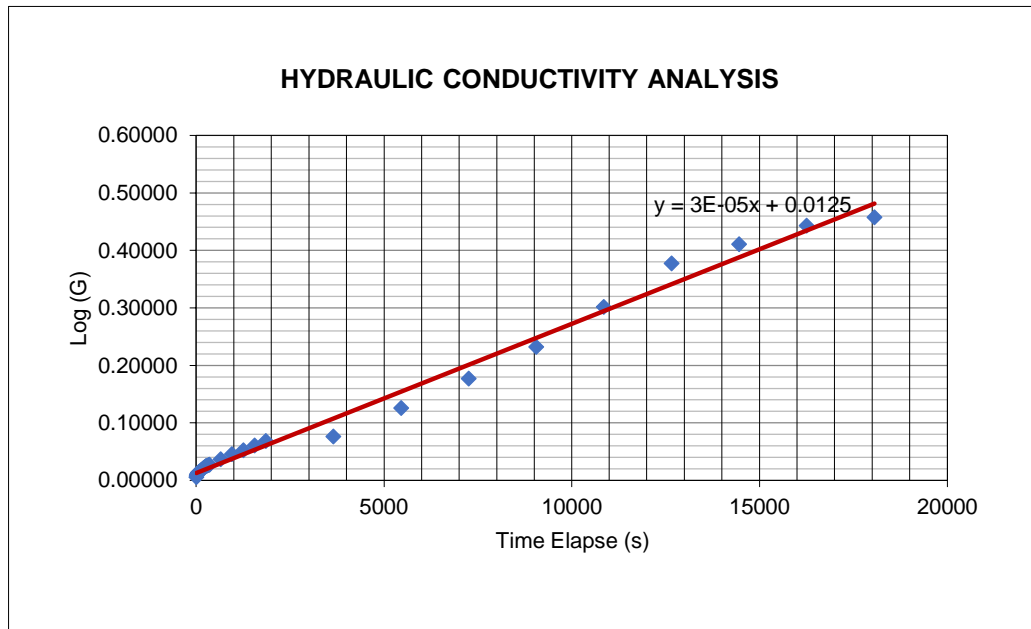
**Location:** 5210 Innes Road, Ottawa  
**Project:** FE-P-22-12470H  
**Test Date:** 10/6/2022  
**Tested by:** CAW  
**Well No.** MW104

**Equilibrium Water level (from top of pipe) HE** 282 cm  
**Initial Water level (from top of pipe) Ho** 558.3 cm  
**Monitoring well inner Dia D** 0.05 m  
**Initial Time offset To** 1 second  
**Reverse of Luthin's reference system Ru = Ho - HE** 276.30 cm  
**Slope of Log((ho-he)/(ht-he)) / T** 3.00E-05  
**G = Ru / (HT - HE)**

**Hydraulic conductivity computed k =**
0.0000454 cm/s  
4.54E-07 m/s  
0.039 m/day

Time (Interval s)	HT (Water Drop )			G	LOG (G)
	(Elapsed s)	( m )	( cm )		
	0	5.583			
10	10	5.550	555.0	1.01209	0.00522
10	20	5.530	553.0	1.01956	0.00841
10	30	5.520	552.0	1.02333	0.01002
10	40	5.510	551.0	1.02714	0.01163
10	50	5.500	550.0	1.03097	0.01325
10	60	5.500	550.0	1.03097	0.01325
30	90	5.490	549.0	1.03483	0.01487
30	120	5.480	548.0	1.03872	0.01650
30	150	5.470	547.0	1.04264	0.01814
30	180	5.460	546.0	1.04659	0.01978
30	210	5.450	545.0	1.05057	0.02143
30	240	5.440	544.0	1.05458	0.02308
30	270	5.430	543.0	1.05862	0.02474
30	300	5.425	542.5	1.06065	0.02557
30	330	5.420	542.0	1.06269	0.02641
30	360	5.415	541.5	1.06474	0.02724
300	660	5.360	536.0	1.08780	0.03655
300	960	5.310	531.0	1.10964	0.04518
300	1260	5.270	527.0	1.12776	0.05221
300	1560	5.225	522.5	1.14886	0.06027
300	1860	5.180	518.0	1.17076	0.06847
1800	3660	5.140	514.0	1.19095	0.07589
1800	5460	4.890	489.0	1.33478	0.12541

**Location:** 5210 Innes Road, Ottawa  
**Project:** FE-P-22-12470H  
**Test Date:** 10/6/2022  
**Tested by:** CAW  
**Well No.** MW104



**Location:** 5210 Innes Road, Ottawa  
**Project:** FE-P-22-12470H  
**Test Date:** 10/6/2022  
**Tested by:** CAW  
**Well No.** MW106

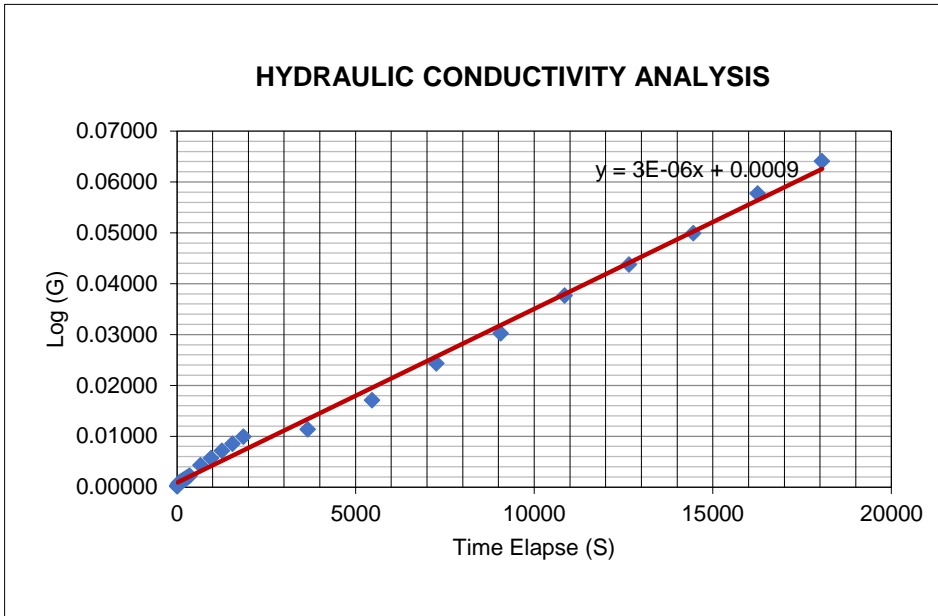
**Equilibrium Water level (from top of pipe) HE** 259 cm  
**Initial Water level (from top of pipe) Ho** 573.1 cm  
**Monitoring well inner Dia D** 0.05 m  
**Initial Time offset To** 1 second  
**Reverse of Luthin's reference system Ru = Ho - HE** 314.10 cm  
**Slope of Log((ho-he)/(ht-he)) / T** 3.00E-06  
**G = Ru / (HT - HE)**

**Hydraulic conductivity computed k =** 0.0000045 cm/s  
 4.54E-08 m/s  
 0.004 m/day

Time (Interval s)	HT (Water Drop)			G	LOG (G)
	(Elapsed s)	( m )	( cm )		
	0	5.731			
10	10	5.730	573.0	1.00032	0.00014
10	20	5.729	572.9	1.00064	0.00028
10	30	5.728	572.8	1.00096	0.00041
10	40	5.727	572.7	1.00128	0.00055
10	50	5.726	572.6	1.00159	0.00069
10	60	5.725	572.5	1.00191	0.00083
30	90	5.724	572.4	1.00223	0.00097
30	120	5.723	572.3	1.00255	0.00111
30	150	5.722	572.2	1.00287	0.00125
30	180	5.721	572.1	1.00319	0.00138
30	210	5.720	572.0	1.00351	0.00152
30	240	5.719	571.9	1.00384	0.00166
30	270	5.718	571.8	1.00416	0.00180
30	300	5.717	571.7	1.00448	0.00194
30	330	5.716	571.6	1.00480	0.00208
30	360	5.715	571.5	1.00512	0.00222
300	660	5.700	570.0	1.00997	0.00431
300	960	5.690	569.0	1.01323	0.00571
300	1260	5.680	568.0	1.01650	0.00711
300	1560	5.670	567.0	1.01981	0.00852
300	1860	5.660	566.0	1.02313	0.00993
1800	3660	5.650	565.0	1.02647	0.01135
1800	5460	5.610	561.0	1.04007	0.01706
1800	7260	5.560	556.0	1.05758	0.02431
1800	9060	5.520	552.0	1.07201	0.03020
1800	10860	5.470	547.0	1.09063	0.03768
1800	12660	5.430	543.0	1.10599	0.04375
1800	14460	5.390	539.0	1.12179	0.04991
1800	16260	5.340	534.0	1.14218	0.05774
1800	18060	5.300	530.0	1.15904	0.06410



Location: 5210 Innes Road, Ottawa  
Project: FE-P-22-12470H  
Test Date: 10/6/2022  
Tested by: CAW  
Well No. MW106



**APPENDIX F – CONSTRUCTION DEWATERING AND PERMANENT  
DRAINAGE**



Location: 5210 Innes Road, Ottawa  
 Project: FE-P-22-12470H  
 Date: 11/25/2022

*Dupuit Forcheimer for Radial Flow to a Closely Welled System or Excavation*

Construction Units	Finished lowest floor elevation (m asl)	Average grade (m asl)	Lowest Conventional Footing Elevation (m asl)	Required Dewatering Elevation (m asl)	Static water level		Well base elevation (m)	H (m)	h <sub>w</sub> (m)	H-h <sub>w</sub> (m)	R <sub>0</sub> (m)		r <sub>w</sub>	ab (m <sup>2</sup> )	K (m/s)	H <sup>2</sup> -h <sub>w</sub> <sup>2</sup>	lnR <sub>0</sub>	lnr <sub>w</sub>	Q <sub>c</sub> (m <sup>3</sup> /s)	Q <sub>c</sub> (m <sup>3</sup> /day)
					BGS (m)	Elevation (m asl)					Model	Adjusted								
Building with no UG level	87.75	87.85	86.25	85.25	1.74	85.93	84.95	0.98	0.3	0.68	0.83	43.29	42.47	5666	3.68E-07	0.87	3.77	3.75	5.23E-05	4.52

Dupuit Forcheimer Equation

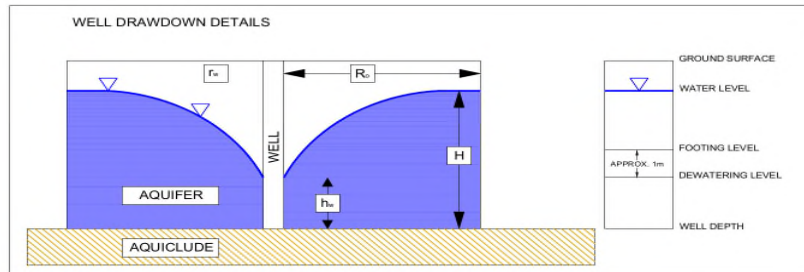
$$Q = \frac{\pi K (H^2 - h_w^2)}{\ln R_0 - \ln r_w}$$

Equivalent radius of well, r<sub>w</sub>

$$r_w = \sqrt{\frac{ab}{\pi}}$$

Radius of influence in m, calculated from Sichardt's equation

$$R_0 = 2000(H - h_w)\sqrt{k}$$

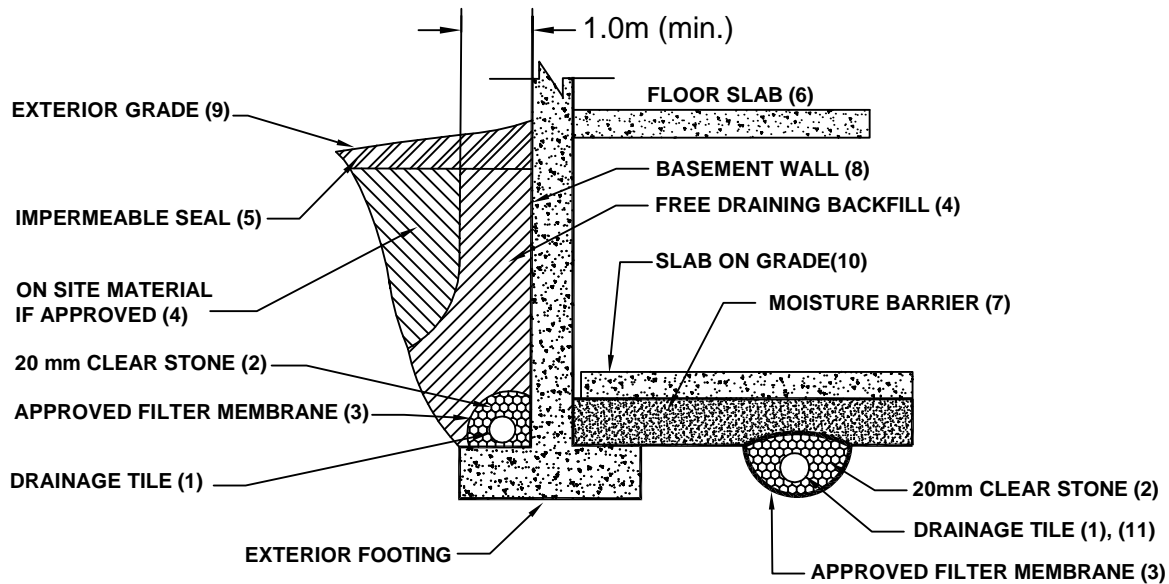


Where:

- r<sub>w</sub> = equivalent radius of the well in m,
- H = hydraulic head of the original water table (total saturated aquifer thickness) in m,
- h<sub>w</sub> = hydraulic head at maximum dewatering (proposed drawdown) in m,
- R<sub>0</sub> = radius of influence in m, calculated from Sichardt's equation, and
- K = hydraulic conductivity, in m/s
- a = length of excavation area in m
- b = width of excavation area in m

## **APPENDIX G – BACKFILL AND DRAINAGE DESIGN**

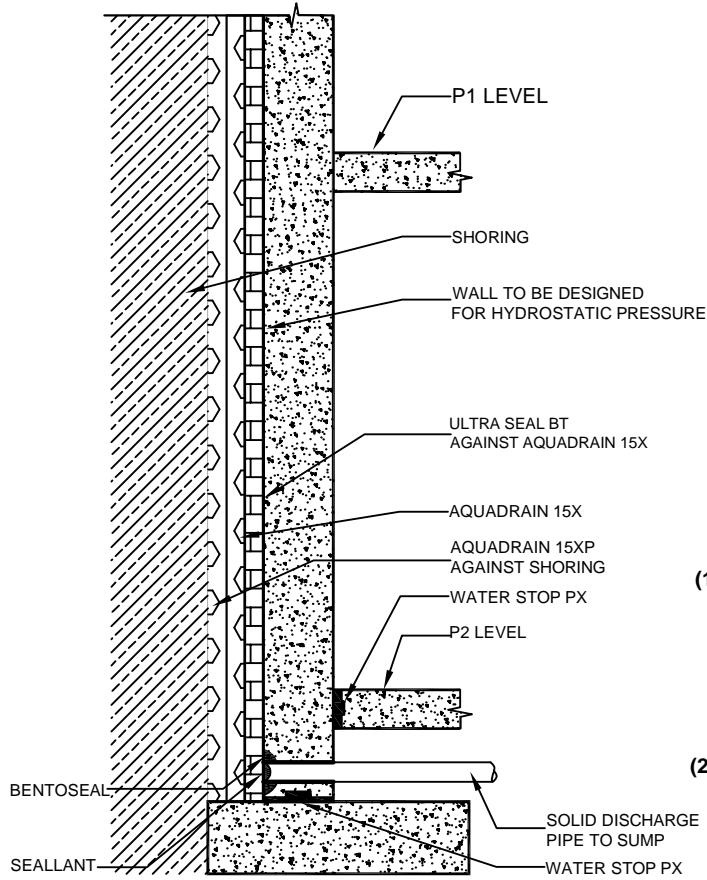




**NOTES:**

- (1) DRAINAGE TILE TO CONSIST OF 100mm (4") DIAMETER WEEPING TILE OR EQUIVALENT PERFORATED PIPE LEADING TO A POSITIVE SUMP OR OUTLET.
- (2) 20mm (3/4") CLEAR STONE - 150mm (6") TOP AND SIDE OF DRAIN. IF DRAIN IS NOT ON FOOTING, PLACE 100mm (4") OF STONE BELOW DRAIN.
- (3) WRAP THE CLEAR STONE WITH AN APPROVED FILTER MEMBRANE (TERRAFIX 279R OR EQUIVALENT).
- (4) FREE DRAINING BACKFILL - OPSS GRANULAR B OR EQUIVALENT COMPACTED TO THE SPECIFIED DENSITY. DO NOT USE HEAVY COMPACTION EQUIPMENT WITHIN 1.8m (6') OF WALL.
- (5) IMPERMEABLE BACKFILL SEAL - COMPACTED CLAY, CLAYEY SILT OR EQUIVALENT. IF ORIGINAL SOIL IS FREE-DRAINING, SEAL MAY BE OMITTED. MAXIMUM THICKNESS OF SEAL TO BE 0.5m.
- (6) DO NOT BACKFILL UNTIL WALL IS SUPPORTED BY BASEMENT AND FLOOR SLABS OR ADEQUATE BRACING.
- (7) MOISTURE BARRIER TO BE AT LEAST 200mm (8") OF COMPACTED CLEAR 20mm (3/4") STONE OR EQUIVALENT FREE DRAINING MATERIAL. A VAPOUR BARRIER MAY BE REQUIRED FOR SPECIALTY FLOORS.
- (8) BASEMENT WALL TO BE DAMP PROOFED.
- (9) EXTERIOR GRADE TO SLOPE AWAY FROM BUILDING.
- (10) SLAB ON GRADE SHOULD NOT BE STRUCTURALLY CONNECTED TO THE WALL OR FOOTING
- (11) UNDERFLOOR DRAIN INVERT TO BE AT LEAST 300mm (12") BELOW UNDERSIDE OF FLOOR SLAB. DRAINAGE TILE PLACED IN PARALLEL ROWS 6 TO 8m (20-25') CENTERS ONE WAY. PLACE DRAIN ON 100mm (4") CLEAR STONE WITH 150mm (6") OF CLEAR STONE ON TOP AND SIDES. ENCLOSE STONE WITH FILTER FABRIC AS NOTED IN (3)
- (12) THE ENTIRE SUBGRADE TO BE SEALED WITH APPROVED FILER FABRIC (TERRAFIX 270R OR EQUIVALENT) IF NON-COHESIVE(SANDY) SOILS BELOW GROUND WATER TABLE ENCOUNTERED.
- (13) DO NOT CONNECT THE UNDERFLOOR DRAINS TO PERIMETER DRAINS.
- (14) REVIEW THE GEOTECHNICAL REPORT FOR SPECIFIC DETAILS.

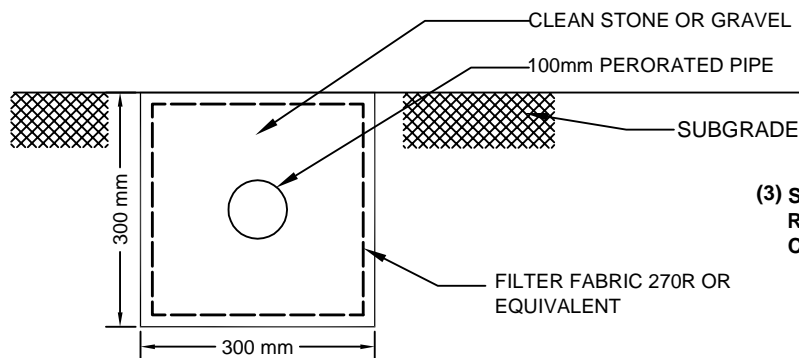
**DRAINAGE AND BACKFILL RECOMMENDATIONS**  
 BASEMENT WITH UNDERFLOOR DRAINAGE  
 (NOT TO SCALE)



**NOTES:**

- (1) ALL PERMANENT DRAINAGE PIPES MUST HAVE GEOTEXTILE FILTER SLEEVE TO PREVENT LONG TERM SILTING. TO FURTHER MINIMIZE SILTATION OF THE DRAINAGE SYSTEM, ALL DRAINAGE PIPE CONNECTION MUST BE SOLID PVC ELBOWS AND Ts. NO "BUTT" END CONNECTIONS SHOULD BE PERMITTED.
- (2) PERIMETER COLLECTION PIPE TO BE SOLID PIPE,

**SUGGESTED EXTERIOR DRAINAGE AGAINST SHORING  
(NOT TO SCALE)**

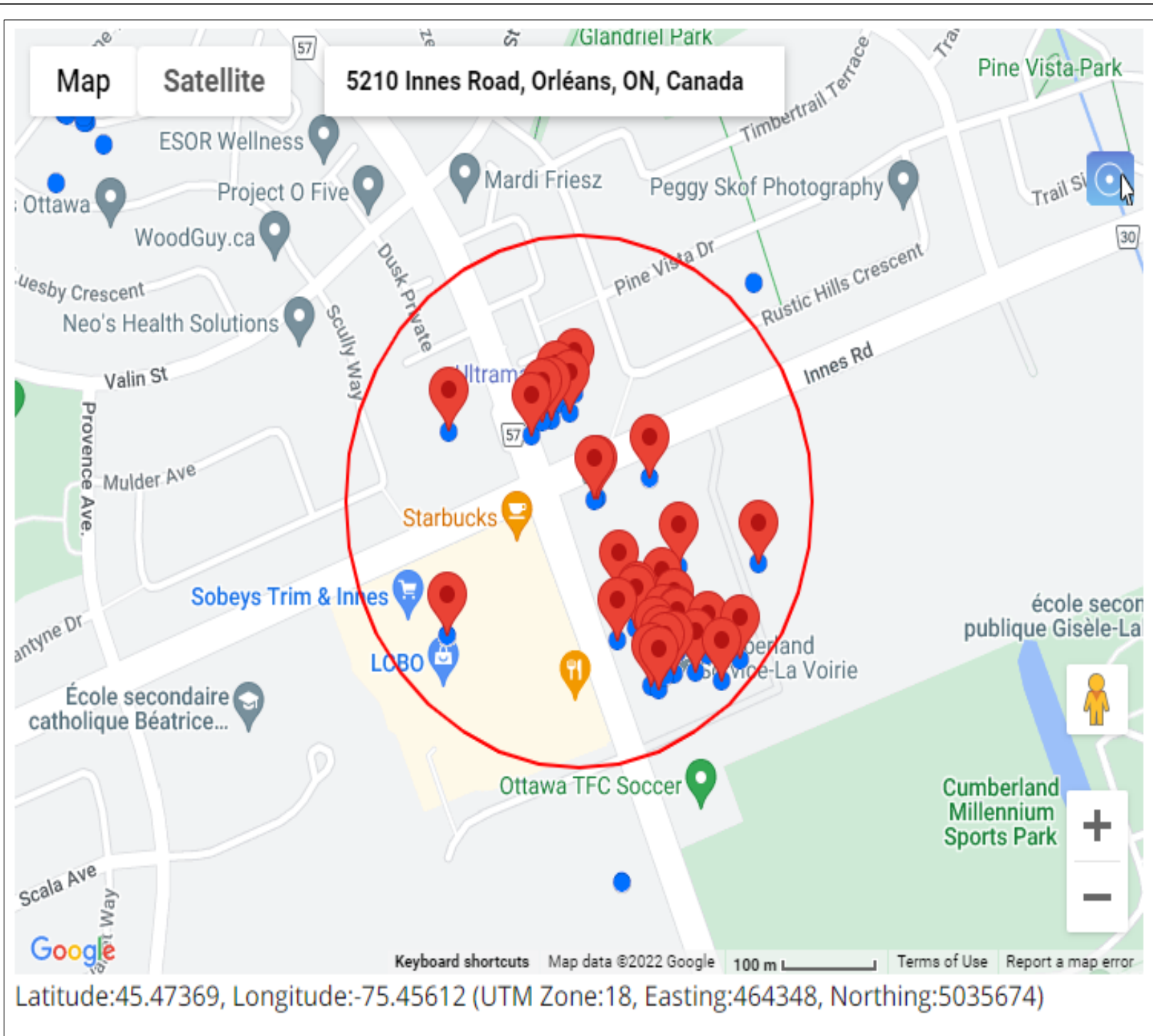


- (3) SUBGRADE DRAIN TO BE PLACED IN PARALLEL ROWS 6-8 m (20'-25'), FROM CENTERLINE TO CENTERLINE.

**DETAIL OF SUBGRADE DRAIN  
(NOT TO SCALE)**

## **APPENDIX H – WELL SURVEY**

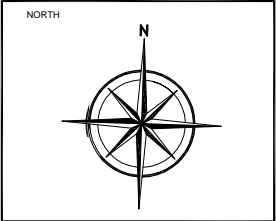




Latitude:45.47369, Longitude:-75.45612 (UTM Zone:18, Easting:464348, Northing:5035674)



400 Esna Park Dr., #15 Tel: 905 475-7755  
 Markham, Ontario Fax: 905 475-7718  
 L3R 9K2



LEGEND

SITE BOUNDARY

---

PROJECT NAME AND ADDRESS

HYDROGEOLOGICAL INVESTIGATION

5210 Innes Road,  
 OTTAWA, ONTARIO

FIGURE 1:

WELLS WITHIN 500M RADIUS

SHEET NO.

PROJECT NO. FE-P22-12470H	<b>H1</b>
DATE NOVEMBER 2022	
SCALE AS SHOWN	



31 G/6e



1512782

GROUND WATER BRANCH  
56 No 535  
27 Dec  
1963

UTM 118z 4643159E

5R 5034968N

The Ontario Water Resources Commission Act

Elev. 92R 102911

# WATER WELL RECORD

Basin Lot 251

County or District Russell

Township, Village, Town or City Cumberland

Con. 9

Lot 1

Date completed August 7, 1963

(day month year)

Address R.R. # 1, Navan, Ont.

### Casing and Screen Record

Inside diameter of casing 2"  
Total length of casing 130'  
Type of screen  
Length of screen  
Depth to top of screen  
Diameter of finished hole 2"

### Pumping Test

Static level 25'  
Test-pumping rate 10 G.P.M.  
Pumping level 40'  
Duration of test pumping 2 hrs.  
Water clear or cloudy at end of test clear  
Recommended pumping rate 10 G.P.M.  
with pump setting of 40 feet below ground surface

### Well Log

### Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
blue clay	0	120		
sand & fine gravel	120	128	142	
grey limestone	128	142		fresh

For what purpose(s) is the water to be used? farm use

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm

G. Charbonneau, Diamond & Cable Drilling

Address R.R. # 1, Box 194, Orleans, Ont.

Licence Number 1025

Name of Driller or Borer G. Charbonneau

Address R.R. # 1, Orleans, Ont.

Date August 7, 1963

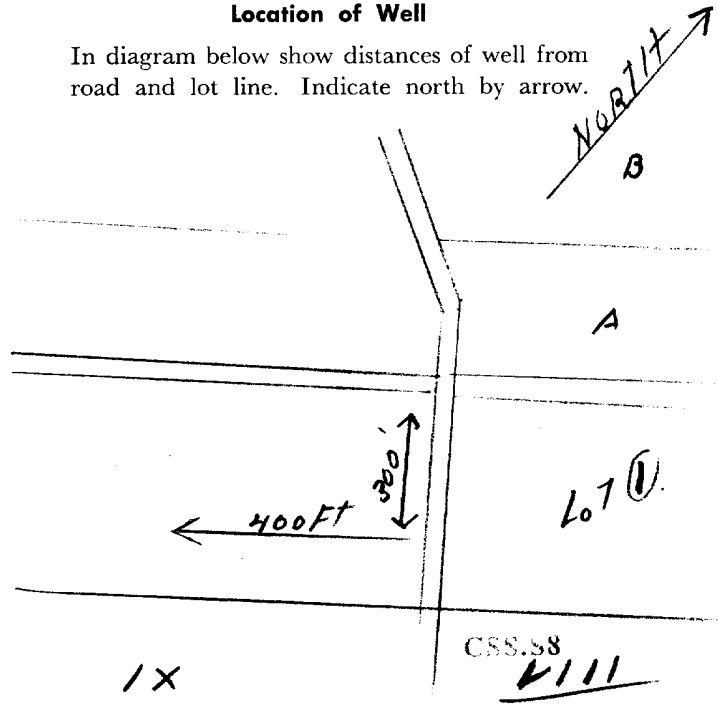
*Gerard Charbonneau*  
(Signature of Licensed Drilling or Boring Contractor)

Form 7 10M-62-1152

OWRC COPY

### Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



IX

CSS.S8

4111



Ministry  
of the  
Environment  
Ontario

The Ontario Water Resources Act

# WATER WELL RECORD

316 6E ✓

1. PRINT ONLY IN SPACES PROVIDED  
2. CHECK  CORRECT BOX WHERE APPLICABLE

11

1518164

MUNICIPALITY 15011

CONTRACTOR CN

08

COUNTY OR DISTRICT OTTAWA TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE Cumberland CON. BLOCK, TRACT, SURVEY, ETC. 8 LOT A

Frederick Russell 2 Pintail Terrace, Cumberland, Ont. DATE COMPLETED DAY 26 MO 04 YR 82

NG 35.199 RC 4 ELEVATION 0290 RC 4 BASIN CODE 126

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)					
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
yellow	clay			0	16
blue	"			16	38
grey	gravel			38	46
"	limestone			46	68

31 0016505 0038305 0046211 0068215

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER			
10-13	1 <input checked="" type="checkbox"/> FRESH	2 <input type="checkbox"/> SALTY	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH	2 <input type="checkbox"/> SALTY	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH	2 <input type="checkbox"/> SALTY	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH	2 <input type="checkbox"/> SALTY	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH	2 <input type="checkbox"/> SALTY	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
6 1/2	STEEL	188	0	51
6	GALVANIZED			51
	CONCRETE			
	OPEN HOLE			

60 SCREEN

SIZE(S) OF OPENING (SLOT NO.)

DIAMETER

LENGTH

MATERIAL AND TYPE

DEPTH TO TOP OF SCREEN

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET		MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
FROM	TO	
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST METHOD

1  PUMP 2  BAILEY

PUMPING RATE 0080 GPM

DURATION OF PUMPING 44 HOURS 00 MINS

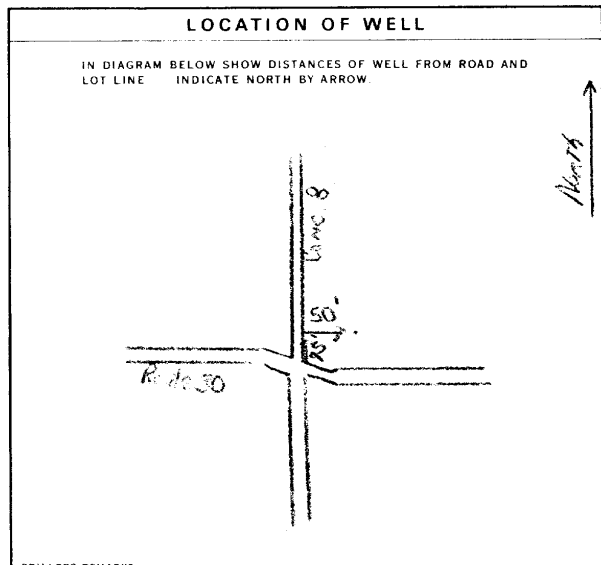
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING			
19-21	22-24	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
017	030	017	017	017	017

IF FLOWING, GIVE RATE

RECOMMENDED PUMP TYPE  SHALLOW  DEEP

RECOMMENDED PUMP SETTING 030 FEET

RECOMMENDED PUMP RATE 0030 GPM



72 FINAL STATUS OF WELL

1  WATER SUPPLY 5  ABANDONED - INSUFFICIENT SUPPLY

2  OBSERVATION WELL 6  ABANDONED - POOR QUALITY

3  TEST HOLE 7  UNFINISHED

4  RECHARGE WELL

73 WATER USE

1  DOMESTIC 5  COMMERCIAL

2  STOCK 6  MUNICIPAL

3  IRRIGATION 7  PUBLIC SUPPLY

4  INDUSTRIAL 8  COOLING OR AIR CONDITIONING

9  OTHER 9  NOT USED

74 METHOD OF DRILLING

1  CABLE TOOL 6  BORING

2  ROTARY (CONVENTIONAL) 7  DIAMOND

3  ROTARY (REVERSE) 8  JETTING

4  ROTARY (AIR) 9  DRIVING

5  AIR PERCUSSION

CONTRACTOR

NAME OF WELL CONTRACTOR G. Charbonneau & Son Drilling Ltd LICENCE NUMBER 1504

ADDRESS R.R. 2, Box 194, Orleans, Ont. K1C 1T1

NAME OF DRILLER OR BORER R. Charbonneau LICENCE NUMBER

SIGNATURE OF CONTRACTOR [Signature]

SUBMISSION DATE DAY 26 MO 04 YR 82

OFFICE USE ONLY

DATA SOURCE

CONTRACTOR 1504 DATE RECEIVED 05 04 83

DATE OF INSPECTION

INSPECTOR

REMARKS

316/6e  
 560 1236  
 1512775  
 3 9  
 14164131612  
 5R 58 13511613  
 5R 021818  
 215 111



GROUND WATER BRANCH  
 JAN 19 1961  
 ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act, 1957

# WATER WELL RECORD

County or District.....Russel.....Township, Village, Town or City.....Cumberland.....  
 Date completed.....17.....Dec.....60.....  
 (day month year)  
 Address.....Navan R.R. No. 1.....



### Casing and Screen Record

Inside diameter of casing.....2".....  
 Total length of casing.....100'.....  
 Type of screen.....  
 Length of screen.....  
 Depth to top of screen.....  
 Diameter of finished hole.....2".....

### Pumping Test

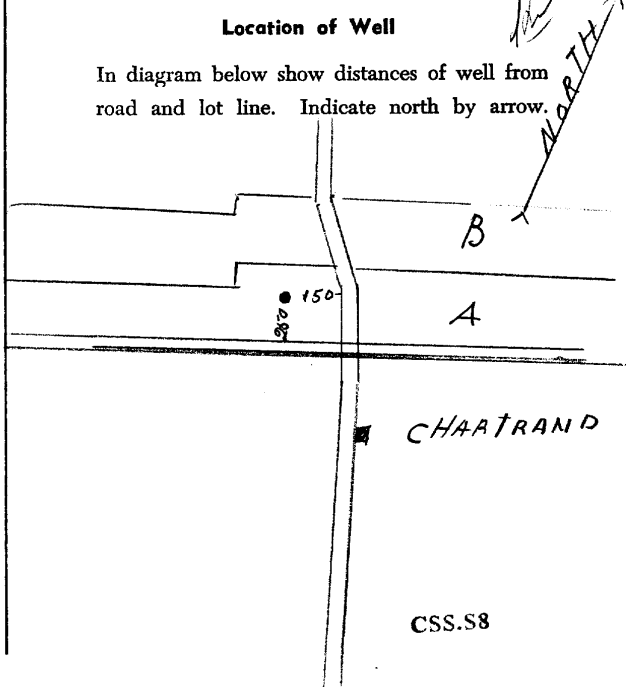
Static level.....19'.....  
 Test-pumping rate.....7.....G.P.M.  
 Pumping level.....25'.....  
 Duration of test pumping.....2 Hrs.....  
 Water clear or cloudy at end of test.....clear.....  
 Recommended pumping rate.....7.....G.P.M.  
 with pumping level of.....~~XXXXXX~~ Pump Set 25'

### Well Log

### Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, sulphur)
Blue Clay	0	90'			
Gravel	90'	100'	100'	81'	Fresh

For what purpose(s) is the water to be used?  
Domestic  
 Is well on upland, in valley, or on hillside?.....WP.....  
 Drilling Firm.....  
 Address.....  
 Licence Number.....454.....  
 Name of Driller.....Gerard Charbonneau.....  
 Address.....Orleans.....  
 Date.....Dec 17/60.....  
*Gerard Charbonneau*  
 (Signature of Licensed Drilling Contractor)



## **APPENDIX I: INFILTRATION TESTS**



## Percolation Test Data Sheet

Project:	5210 Innes Rd, Ottawa	Project No	22-12470	Date:	10/6/2022
Test Hole No:	<b>TP1</b>	Tested By:	CAW		
Depth of Test Hole, $D_T$ :	1.98	USCS Soil Classification:	CL		
Test Hole Dimensions (cm)				Length	Width
Radius (if round)=	4"	Sides (if rectangular)=			

### Sandy Soil Criteria Tests

Trial No.	StartTime	Stop Time	Time Interval (min)	Initial Depth to Water (cm)	Final Depth to Water (cm)	Change in Water Level (cm)	Greater than or Equal to 6"
1	13:30	13:55	0:25	80	81.12	1.12	Less
2	14:00	14:25	0:25	75	76.1	1.1	Less

If two consecutive measurements show that six inches of water seeps away in less than 25 minutes (150mm), the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Test No.	Start Time	Stop Time	$\Delta t$ Time Interval (min)	$D_0$ Initial Depth to Water (cm)	$D_f$ Final Depth to Water (cm)	$\Delta D$ Change in Water Level (cm)	Percolation Rate (min/cm)
1	9:31	10:01	30.00	96.50	96.90	0.40	25.00
2	10:01	10:31	30.00	96.90	97.40	0.50	20.00
3	10:31	11:01	30.00	97.40	97.80	0.40	25.00
4	11:01	11:31	30.00	97.80	98.30	0.50	20.00
5	11:31	12:01	30.00	98.30	98.70	0.40	25.00
6	12:01	12:31	30.00	98.70	99.10	0.40	25.00
7	12:31	13:01	30.00	99.10	99.60	0.50	20.00
8	13:01	13:31	30.00	99.60	99.80	0.20	50.00
9	13:31	14:01	30.00	99.80	100.00	0.20	50.00
10	14:01	14:31	30.00	100.00	100.20	0.20	50.00
11	14:31	15:01	30.00	100.20	100.40	0.20	50.00

COMMENTS: Sunny (11 °C), Pre soak overnight: water fell 34mm in 19 hours

## Percolation Test Data Sheet

Project:	5210 Innes Rd, Ottawa	Project No	22-12470	Date:	10/6/2022		
Test Hole No:	<b>TP2</b>	Tested By:	CAW				
Depth of Test Hole, $D_T$ :	1.98	USCS Soil Classification:	C.L				
Test Hole Dimensions (cm)				Length	Width		
Radius (if round)=	4"	Sides (if rectangular)=					
Sandy Soil Criteria Tests							
Trial No.	Start Time	Stop Time	Time Interval (min)	Initial Depth to Water (cm)	Final Depth to Water (cm)	Change in Water Level (cm)	Greater than or Equal to 6"
1	13:40	14:05	0:25	61	62.2	1.2	Less
2	14:10	14:35	0:25	63	64.3	1.3	Less
<p>If two consecutive measurements show that six inches of water seeps away in less than 25 minutes (150mm), the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".</p>							
Test No.	Start Time	Stop Time	$\Delta t$ Time Interval (min)	$D_o$ Initial Depth to Water (cm)	$D_f$ Final Depth to Water (cm)	$\Delta D$ Change in Water Level (cm)	Percolation Rate (min/cm)
1	9:21	9:51	30.00	103.00	103.60	0.60	16.67
2	9:51	10:21	30.00	103.60	104.10	0.50	20.00
3	10:21	10:51	30.00	104.10	104.60	0.50	20.00
4	10:51	11:21	30.00	104.60	104.90	0.30	33.33
5	11:21	11:51	30.00	104.90	105.50	0.60	16.67
6	11:51	12:21	30.00	105.50	105.80	0.30	33.33
7	12:21	12:51	30.00	105.80	106.10	0.30	33.33
8	12:51	13:21	30.00	106.10	106.40	0.30	33.33
9	13:21	13:51	30.00	106.40	106.70	0.30	33.33
10	13:51	14:21	30.00	106.70	107.00	0.30	33.33
<p>COMMENTS: Sunny (11 °C), Pre soak overnight: water fell 37mm in 19 hours</p>							