BURNSIDE

Dewatering Assessment
Preserve Block 300
North Oakville

Mattamy (Carding Mill) Limited

Dewatering Assessment
Preserve Block 300
North Oakville

Mattamy (Carding Mill) Limited

R.J. Burnside & Associates Limited
292 Speedvale Avenue West Unit 20
Guelph ON N1H 1C4 CANADA

October 2023 (Revised November 3, 2023)
300055341.0000

Distribution List

No. of Hard Copies	PDF	Email	Organization Name
0	Yes	Yes	Richard Dowson c/o Mattamy (Carding Mill) Limited

Record of Revisions

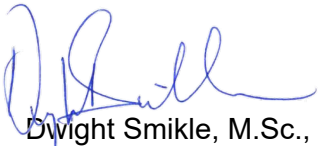
Revision	Date	Description
1	October 26, 2023	Initial Submission to Mattamy
2	November 3, 2023	Revised Submission to Mattamy

R.J. Burnside & Associates Limited

Report Prepared By:

Josh Donkersgoed, P.Eng.
Project Engineer
JD:js:jh

Report Reviewed By:



Dwight Smikle, M.Sc., P.Geo.
Senior Hydrogeologist
DS:js:jh

Table of Contents

Figures (located at back of report)

Appendices

Disclaimer

Other than by the addressee, copying or distribution of this document, in whole or in part, is not permitted without the express written consent of R.J. Burnside & Associates Limited.

In the preparation of the various instruments of service contained herein, R.J. Burnside & Associates Limited was required to use and rely upon various sources of information (including but not limited to: reports, data, drawings, observations) produced by parties other than R.J. Burnside & Associates Limited. For its part R.J. Burnside & Associates Limited has proceeded based on the belief that the third-party/parties in question produced this documentation using accepted industry standards and best practices and that all information was therefore accurate, correct and free of errors at the time of consultation. As such, the comments, recommendations and materials presented in this instrument of service reflect our best judgment in light of the information available at the time of preparation. R.J. Burnside & Associates Limited, its employees, affiliates and subcontractors accept no liability for inaccuracies or errors in the instruments of service provided to the client, arising from deficiencies in the aforementioned third-party materials and documents.

R.J. Burnside & Associates Limited makes no warranties, either express or implied, of merchantability and fitness of the documents and other instruments of service for any purpose other than that specified by the contract.

1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) has been retained by Mattamy (Carding Mill) Limited (Mattamy) to evaluate the potential volume of groundwater that may be encountered during construction of an underground parking structure located in the North Preserve Block 300 area of North Oakville.

The property (herein referred to as the site) is located north of North Park Boulevard and west of Carding Mill Trail and within a residential subdivision. The property is approximately 0.8 ha (2 acres) in size. The location of the site is provided in Figure 1. The site is surrounded by single family dwellings to the north, south and west, and a mid-rise residential building in the late stages of construction to the east. A storm water management pond is located 80 m to the east (Figure 1).

Due to shallow groundwater conditions observed during construction, it is anticipated that dewatering may be required during construction of the foundations and underground parking. The Ministry of the Environment, Conservation and Parks (MECP) has regulations that allow for construction related dewatering to proceed under the Environmental Activity Sector Registry (EASR) process if dewatering volumes are above 50,000 L/day but below 400,000 L/day. Takings above 400,000 L/day require a Category 3 Permit to Take Water (PTTW). The determination of which process should be followed (PTTW or EASR) is based on the expected volume of taking during dewatering. A hydrogeological report is required for both the EASR and PTTW processes.

The current report has been completed to assess the potential groundwater volumes to be controlled during construction and to determine the permit process required to be followed (EASR or PTTW). The report also provides the hydrogeological support for construction dewatering activities on the site, i.e., impact evaluation of the water taking along with appropriate mitigation and contingency measures.

1.1 Background and Previous Studies

Burnside has completed a number of hydrogeological studies in the area of the proposed Block 300 development; including the hydrogeological components of the Shannon's and Munn's Creeks and Preserve Lands Environmental Implementation Report and Functional Servicing Study (November 2011) and Preserve North Environmental Implementation Report and Functional Servicing Study (February 2019). In addition to the Burnside studies a site specific study was completed and was incorporated into this report:

- "Geotechnical Investigation Report, Proposed Residential Condominium Development, Block 300, Preserve Property, Northwest Corner of Carding Mill Trail & North Park Boulevard, Oakville, Ontario" prepared by Shad & Associates Inc. for Mattamy Development Corporation, Dated June 20, 2020.

2.0 Physical Setting

2.1 Topography and Drainage

The site is located in the Munn's Creek subwatershed of the larger Sixteen Mile Creek watershed in the jurisdiction of Conservation Halton (CH). The site is surrounded by residential development and there are no natural features in the immediate vicinity of the site (Figure 1). Wooded wetlands that are part of Natural Heritage Systems are located approximately 400 m to the north.

The surrounding land is relatively flat, with local drainage generally towards the south. Surface drainage in the surrounding area is controlled by the subdivision storm water management system.

There is a stormwater management pond and storm water channel located approximately 80 m east of the site (Figure 1).

2.2 Geology

2.3 Regional Geology

Surficial geology mapping published by the Ontario Geological Survey (OGS, 2010) shows that the site and surrounding area are underlain by till consisting of primarily clay and silt deposits.

Bedrock mapping published by the Ontario Geological Survey (2011) shows that uppermost bedrock for the site and surrounding area is the Queenston formation, consisting primarily of shale. OGS mapping indicates the depth to bedrock ranges between 10 to 30 mbgs, with the surface of the bedrock generally sloping to the south.

3.0 Hydrogeology

There have been a number of hydrogeological studies completed in the area of the proposed Block 300 development by Burnside including the hydrogeological components of the Shannon's and Munn's Creeks and Preserve Lands Environmental Implementation Report and Functional Servicing Study (November 2011) and Preserve North Environmental Implementation Report and Functional Servicing Study (February 2019). Site specific geotechnical work completed by Shad & Associates (Shad, June 2020) was also reviewed by Burnside and provided data to characterize the local groundwater and soil conditions. The information compiled as part of these studies indicates that the subsurface in the area consists of low permeability glacial till sediments overlying shale bedrock. The Shad (2020) geotechnical investigation found the till generally consists of silty clay to clayey silt till with occasional layers of sandy silt till from 3.2 m to 5.2 m below existing ground surface. The till is then underlain by a till-shale complex or weathered shale. The locations of the boreholes completed by Shad

(2020) are shown on Figure 2. A cross-section showing the interpreted on-site geology is shown on Figure 3.

3.1 Local Groundwater Use

There is no anticipated groundwater use in the area as the area is surrounded by new development that is serviced by municipal water. The source of municipal water for the area is from Lake Ontario. Due to the newly developed nature of the development, no use of groundwater is anticipated and there are no existing users that are dependent on groundwater.

3.2 Soil Hydraulic Conductivity

The sediments found in the area of the site are fine-grained and are considered to be poor aquifers (aquitards). Hydraulic conductivity testing of these sediments conducted by Burnside in the Preserve North area (October 2017) has shown the hydraulic conductivity of these sediments to range between 8.6 x 10^{-9} m/s and 2.0 x 10^{-7} m/s. These values are recognized as low and suggest that groundwater movement within these sediments will be limited.

The hydraulic conductivity of the shale bedrock is known to be linked to its degree of weathering and fracturing and the zone of greatest groundwater transmission is generally found at the contact between the shale and overlying overburden. The competence of the shale tends to increase with depth and groundwater flow in deeper bedrock zones is expected to be minimal. Hydraulic conductivity calculated from slug tests completed in the top of the shale in the area typically ranges from 10^{-7} to 10^{-9} m/s. A hydrogeological study completed by Burnside on lands located 500 m to the north found hydraulic conductivity in wells completed in the upper shale ranged from 8.6 × 10^{-9} to 2.0 × 10^{-7} m/s.

3.3 Site Observations During Construction

Construction of a shoring system was started in the summer of 2023. During this construction a series of caisson boreholes were excavated across the site. The caisson boreholes are approximately 750 mm diameter holes excavated down to a depth of 7 to 9 m. The caissons were generally 3 m apart and distributed around the perimeter of the foundation. During excavation for the caissons, water was observed quickly entering the large diameter holes. It is interpreted that this water was ponding within the subsurface in the vicinity of the caissons due to the low permeability of the surrounding sediments. In order to determine the volume of water that needed to be removed for eventual excavation for the building, a pumping test was completed in one of the boreholes to assess the potential dewatering volumes. The pumping test consisted of continuous pumping from one of the boreholes for 15 hours. The response in the borehole and other nearby boreholes was used to estimate a hydraulic conductivity of approximately 10^{-3} m/s. The pumping test analysis is included in Appendix B.

The value obtained from the pumping test is noted to be a very high hydraulic conductivity compared to the typical ranges for these sediments and the values previously measured in this area. It is interpreted that the permeability of the local shale may have been increased by the on-site construction activity with the pilings providing preferential pathways for surface water to enter the subsurface. It is noted that while these conditions exist locally, the regional hydraulic conductivity will be closer to the expected range.

3.4 Groundwater Levels

A review of available hydrogeological information for the area shows that the water table is located within the silty clay till/weathered shale bedrock. Hydrographs produced by Burnside for the Preserve North area (February 2019) indicate that seasonal groundwater level variations may be in the order of 2 m to 3 m. Under existing conditions, the water table elevation in the Block 300 area is estimated to range from about 167 masl to 169 masl.

Monitoring wells were installed by Shad in four of the eight boreholes as part of the Geotechnical Investigation (2020). Water levels were measured in June 2020 and ranged between 166.0 and 166.6 m above sea level (4.1 to 4.8 m below ground surface).

Groundwater levels in the shale were also measured in large diameter shoring boreholes during site visits in September 2023. The depth to groundwater was measured to be between 5.4 and 5.6 m below ground surface (i.e., ±165.5 m above sea level).

3.5 Groundwater Vulnerability and Source Protection

The vulnerability of aquifers to contamination is a concern and the potential for dewatering to impact aquifer vulnerability or cause contamination should be examined as part of a hydrogeological assessment. Aquifer vulnerability refers to the susceptibility of the aquifer to potential contamination. Some degree of protection for groundwater quality from natural and human impacts is provided by the soil above the water table. The degree of protection is dependent upon the depth to the water table (for unconfined aquifers) or the depth of the aquifer (for confined aquifers) and the type of soil above the water table or aquifer.

The site is located in the Halton Region Source Protection Area and is subject to policies within this jurisdiction. There are no wellhead protection areas (WHPA), significant groundwater recharge areas (SGRA), or highly vulnerable aquifers (HVA) in the vicinity of the site. It is noted that there are no policies within the relevant source protection plan that are applicable to the proposed activity (dewatering).

4.0 Water Quality

The local groundwater quality in North Oakville is considered to be relatively poor in relation to drinking water supply as the Queenston Shale exerts a strong influence on groundwater quality. Groundwater influenced by the Queenston Shale is typically characterized as having high total dissolved solids (TDS) as well as elevated chloride, sodium, and sulphate concentrations. Metals such as iron and manganese may be elevated in samples that are high in TDS, but these observations are all indicative of the mineralized nature of the natural groundwater.

Sampling conducted at a monitoring well in the vicinity of Block 300 as part of previous studies indicates that the groundwater in the area is hard and mineralized with high TDS and conductivity. Chloride was reported to be below 5 mg/L and sodium was reported at 37 mg/L. The concentrations of iron and manganese were 1.18 mg/L and 0.126 mg/L, respectively.

Groundwater sampling was completed at on site monitoring wells BH1W and BH2W on April 4, 2023 for comparison to the sewer by-law guidelines for Halton Region. The wells produced limited water, and the rate of seepage into the well was estimated at 0.1 L/hour which is very low. The full sample was not able to be collected for either well. However, the majority of parameters were able to be analyzed, including all the contaminants more likely to be of concern. All parameters analyzed were within the sewer by-law guidelines for Halton Region.

The water quality analysis results included in Appendix D.

5.0 Construction Dewatering Requirements

In order to complete the construction of the foundation and footings an excavation below the anticipated level of groundwater is required. The excavation will extend below the shallow water table and localized dewatering will be required in order for the construction to be completed in the dry.

5.1 Groundwater Seepage

The amount of groundwater seepage into the open excavation that will be encountered during construction is controlled by the hydraulic conductivity of the sediments that make up the subsurface deposits, as well as the local hydraulic gradients. Conditions such as the degree of weathering and fracturing, as well as the amount of silt and sand and layering, may affect the overall effective hydraulic conductivity of the overburden deposits.

The required drawdown has been estimated based on available water table elevation information and the proposed depths of the excavations. The extent of groundwater dewatering required in the excavations can be estimated using the following formulae as presented in Groundwater Lowering in Construction: A Practical Guide to Dewatering, 2nd Edition" (Cashman & Preen, 2013).

The following equation is appropriate for large open excavations under confined conditions:

$$Q = \pi B K (H – h) / (\ln R_o / r_s)$$

Where:

Q = Discharge (m^3/sec)
K = Hydraulic Conductivity (m/sec)
H = Initial water level relative to datum (m)
h = Final water level relative to the datum required for dewatering (m)
R_0 = Radius of influence of dewatering (m)
r_s = Equivalent radius of dewatering well (m)
π = 3.1416
B = thickness of confined aquifer (m)

Dewatering calculations have been completed based on the pumping test analysis, the anticipated excavation elevations, and the maximum water table elevation recorded at a nearby monitoring well screened within the formation to be dewatered (Table C-1). The hydraulic conductivity has been assumed to be 2.0 x 10^{-7} cm/s, which is more consistent with the known value for the sediments encountered in the area. In addition, the historical groundwater levels for the area were used to provide a more conservative estimate of dewatering volumes, as the water levels measured most recently are interpreted to be close to the seasonal low.

The extreme value calculated from the pumping test was also used for the calculations for comparison purposes. The recently measured on-site levels were used for this on-site calculation. We note this value is interpreted to have been caused by the onsite activities and does not reflect the conditions in the area. While the local conditions will affect the short term dewatering rates, it is expected that any need for long term dewatering would be governed by the regional hydrogeological conditions.

The dewatering calculations are presented in Table C-1 in Appendix C. The calculations indicate that the anticipated dewatering volume is less than 2,000 L/day. However, due to uncertainty of the local conditions and the potential for water to be present due to surface runoff being directed into the ground via the caissons, the initial volumes are expected to be higher. To account for the possibility of excess water we recommend a construction EASR be registered for the maximum dewatering volume (400,000 L/day).

5.2 Precipitation and Runoff

It is noted that a precipitation event occurring when the excavation is open is likely to increase the volume of water requiring removal as the low permeability soils produce significant volumes of runoff. It is anticipated that after rainfall events the volume of water taking may have to be temporarily increased to control volume of runoff and seepage into open excavations. In the event of precipitation, water falling directly on the construction area will likely pool in excavation areas. For work to continue, the water will need to be pumped. The additional volume from precipitation directly entering the excavation during a 25 mm precipitation is approximately 110,000 L. The volume of water that represents storm water may be pumped using the EASR exemption for storm water and it is recommended that a record of the occurrence of any such storm event be kept in order to satisfy MECP requirements. Additionally, all discharge after an event should be handled in accordance with the discharge plan outlined below.

In order to reduce the impact to the town storm water management system, during significant or extended periods of rain, dewatering activity should be reduced to the minimum level required to maintain integrity of the excavation.

6.0 Potential for Long-term Dewatering

The need for long term dewatering is expected to be controlled by the regional conditions. The lowest level of parking is understood to be at 163.4 masl. The typical groundwater levels, based on historical monitoring, range between 167 and 169 masl. The long term dewatering requirements to lower groundwater levels to below the lowest parking level have been calculated using the previously measured hydraulic conductivity values for the area using the methods described in Section 5.1 above.

The results of the calculations indicate the anticipated volume for long dewatering would be 1,700 L/day, or approximately 1 L/min. The calculations are presented in Table C-1 in Appendix C.

7.0 Impact Evaluation

7.1 Zone of Influence

The extent of the water table drawdown (i.e., Zone of Influence/Radius of Influence) that may occur when excavations are dewatered by pumping or gravity drainage has been approximated with an empirical relationship by Sichart and Kryieleis and presented in “Groundwater Lowering in Construction – A Practical Guide to Dewatering, 2nd Edition” (Cashman & Preen, 2013).

The radius of influence due to dewatering by seepage may be estimated from the following equation for radial sources or large open excavations:

$$R_0 = 3000\ (H-h)\ K^{0.5}$$

Where:

K = Hydraulic conductivity (m/sec)
H = Existing height of the water table relative to datum (m)
h = Height of the water table after dewatering relative to datum (m)
R_0 = Lateral extent of drawdown/radius of influence//Zone of Influence (m)

The radius of influence calculation is presented in Table C-1 in Appendix C. A radius of influence of 600 m was calculated using the conductivity value obtained during the pumping test. It is recognized that this value is very conservative (i.e., high) as it assumes that the highly permeable on-site shale extends offsite. The practical experience indicates that the high permeability zone is of limited extent and is limited to the area affected by on site construction. In order to determine the extent of the radius of influence under regional conditions, the calculations were repeated using the regional values. This approach resulted in a radius of influence of 46 m and this value was used to define the zone of influence shown on Figure 2.

7.2 Private Water Well Interference Assessment

There are no supply wells within the anticipated area of influence, and therefore no impact to water supply wells is anticipated.

7.3 Potential Surface Water Impacts

There are no natural surface water bodies within the zone of influence. There is a stormwater management pond and storm water channel approximately 80 m to the east. The construction of the pond located 80 m to the east did not encounter a similar zone of high permeability and it is concluded that this zone does not extend to the pond. The potential for impact to the pond is therefore regarded as limited.

Water pumped as a result of dewatering will need to be properly handled in order to ensure that the storm water management system and receiving water bodies and stormwater management systems are not impacted by the discharge of water from dewatering. In order to ensure no impact, erosion and sediment control measures for dewatering discharge will need to be implemented.

7.4 Movement of Groundwater and Contaminants

The surrounding lands are residential properties and the presence of contaminants that could be transported or moved during dewatering of the site are not anticipated. The groundwater sampling completed for discharge of groundwater indicates that there are no parameters of concern.

7.5 Settlement

It is recommended that the project geotechnical engineer be requested to provide an analysis of the potential for settlement within the zone of influence.

8.0 Discharge Plan

The sampling previously completed by Burnside indicates that groundwater on the site met all analyzed standards for discharge to Town of Oakville storm water system sewers. An approved ESC system will be implemented as part of the discharge plan and inspections of all ESC measures will be undertaken by qualified personnel. All discharge will occur to approved ESC facilities where conditioning will occur before any discharge to the natural environment. These measures should ensure that water discharged to the natural environment is in keeping with applicable standards. During the dewatering, visual inspection of the water quality should be completed by the dewatering contractor daily on the days that there is actual discharge. Should any sheen or elevated turbidity in the discharge be identified, appropriate treatment measures should be implemented which may include containment or additional erosion and sediment control measures.

An erosion and sediment control plan (ESC plan) should be developed by a suitably qualified engineer. The ESC plan should outline the location of discharge and treatment control measures that need to be in place in order for dewatering to take place. The ESC measures that are in place should be inspected before the startup of any dewatering. No dewatering should take place without the ESC plan being prepared. The ESC plan should incorporate the recommendations of this report and should be kept together and read with this report.

The actual volume of taking should be measured or calculated on any day that water is taken from an excavation.

The volume of groundwater to be discharged per day is estimated to be up to 400,000 L/day initially and 17,000 L per day over the long term. After ESC measures, the groundwater should be discharged into the existing storm water sewers catch basins in the surrounding roads.

The proposed works qualify for registration under the EASR and it is recommended that this registration be completed.

9.0 Mitigation and Contingency Plans for Dewatering Activities

Mitigation activities and contingency plans include, but are not limited to the following:

- Should there be significant changes in the volume of water taking predicted the project hydrogeologist should be notified and the situation reassessed based on actual in field observations.
- Should any sheen or elevated turbidity in the discharge be identified, appropriate treatment measures should be implemented which may include containment or additional erosion and sediment control measures.
- Should there be significant storm related precipitation events during active dewatering, dewatering volumes should be reduced during the storm event as much as possible in order to reduce potential for overloading the storm water management system.

10.0 Recommendations

Based on the data reviewed as part of this study, the following recommendations are provided:

- A registration under the EASR process be undertaken to allow for the dewatering of the site.
- ESC measures should be undertaken as recommended by a suitably qualified engineer.
- A settlement analysis should be completed based on the expected dewatering requirements.
- The above mitigation measures should be implemented if required.

11.0 Qualifications of Authors

This report was completed in accordance with the applicable provincial standards and in particular with the requirements for the technical assessment (water taking) required for an EASR registration.

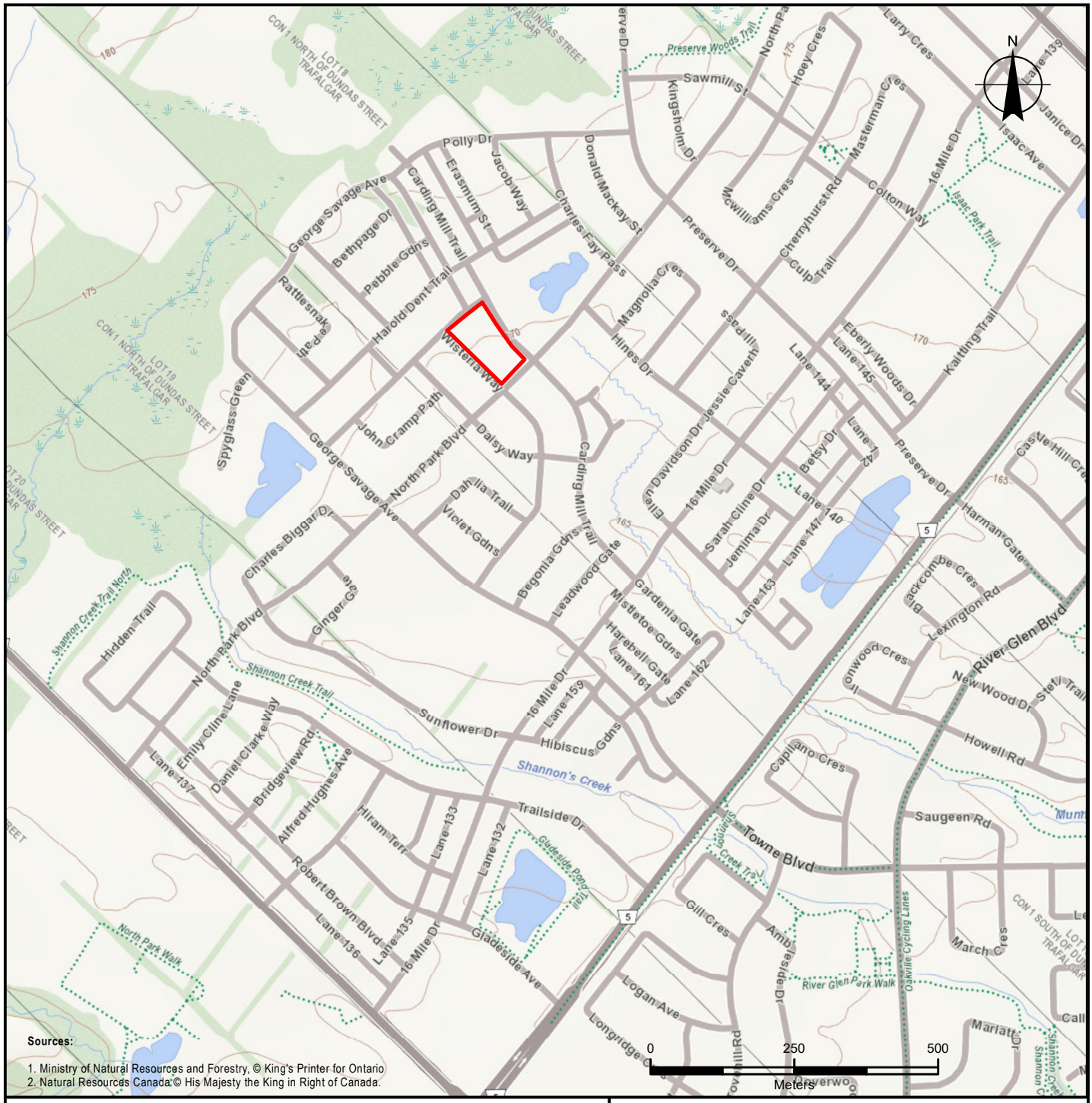
This report was prepared by Joshua Donkersgoed, P.Eng. Mr. Donkersgoed is a practicing engineer (#100184156) registered with the Professional Engineers of Ontario (PEO). He has been practicing in the area of groundwater resource assessment since 2012.

The report has been reviewed by Dwight Smikle, P.Geo. Mr. Smikle is a practicing geoscientist (#1293) registered with the Professional Geoscientists of Ontario. Mr. Smikle is fully qualified to conduct this assessment and has over 30 years' experience in hydrogeology.

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Figures



LEGEND

SUBJECT LANDS

BURNSIDE

Client / Report

BLOCK 300 LOWER FOURTH
OAKVILLE, ONTARIO

DEWATERING ASSESSMENT

Figure Title:

SITE LOCATION

Drawn	Checked	Date	Figure No.
SK	JD	OCTOBER 2023	1
Scale		Project No.	
1:10,000		300055341	

Path:Nigel/Shared Work Areas/ A:\055341 Block 300 Lower Fourth\06_GIS\055341 Site Location.mxd Date Saved: Wednesday, October 25, 2023

LEGEND

- SUBJECT LANDS
- MONITORING WELL (SHAD, 2020)
- A A' CROSS-SECTION LOCATION KEY
- ZONE OF INFLUENCE (46m)

0 40 80 120 160
Metres

N

BURNSIDE

Client / Report

BLOCK 300 LOWER FOURTH
OAKVILLE, ONTARIO

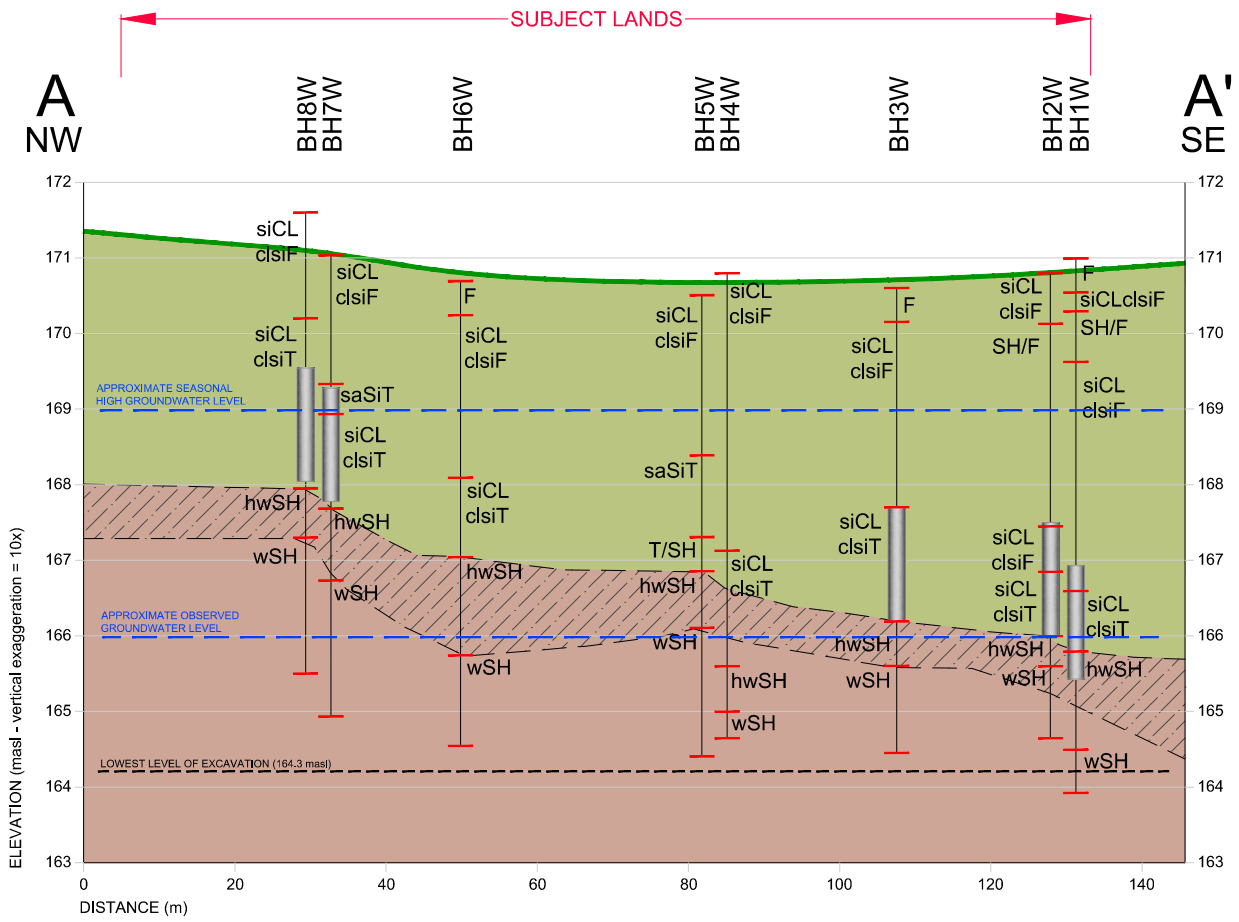
DEWATERING ASSESSMENT

Figure Title

SITE PLAN

Drawn	Checked	Date	Figure No.
SK	JD	OCTOBER 2023	2
Scale		Project No.	
1:2,000		300055341	

File: N:\gel\Shared Work Area\NIGEL\Shared Work Areas\055341 Block 300 Lower Fourth\02_Production\055341 Block 300 Dewatering Assessment.dwg Date Plotted: November 3, 2023 - 2:42 PM



LEGEND

BH1 — WELL NUMBER / ID

EXISTING GROUND PROFILE

GEOLOGICAL CONTACT

WELL SCREEN

INTERPRETED STRATIGRAPHY

SILT / CLAY / TILL

HIGHLY WEATHERED SHALE

WEATHERED SHALE

si	SILTY
sa	SANDY
cl	CLAYEY
TS	TOPSOIL
F	FILL
T	TILL
GR	GRAVEL
SA	SAND
Si	SILT
CL	CLAY
ST	STONES
SH	SHALE

BURNSIDE

Client / Report

BLOCK 300 LOWER FOURTH
OAKVILLE, ONTARIO

DEWATERING ASSESSMENT

Figure Title

INTERPRETED GEOLOGICAL CROSS-SECTION A-A'

Drawn	Checked	Date	Figure No.
SK	JD	OCTOBER 2023	3
Scale		Project No.	
1:1,000		300055341	

File: Nigel/Shared Work Area/ \NIGEL\Shared Work Areas\055341 Block 300 Lower Fourth\02_Production\055341 Block 300 Dewatering Assessment.dwg Date Plotted: October 25, 2023 - 4:32 PM

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

Borehole Logs

RECORD OF BOREHOLE 1W

Project No.: T20799 W | CLIENT: Mattamy Development Corporation | ORIGINATED BY: R.H.

DATE: June 2-3, 2020 | LOCATION: Carding Mill Trail, Oakville, Ontario | COMPILED BY: R.H.

DATUM: Geodetic | BOREHOLE TYPE: Solid Stem | CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS
~ 171.0		Ground Surface						
	0	**100mm Asphalt**						
170.5		**Granular Fill**		1	SS	46	5	
170.3		brown **Silty Clay/Clayey Silt Fill** some gravels moist						
	1	grey **Shale Fill** damp		2	SS	15	17	
169.6								
				3	SS	15	35	
	2	reddish brown **Silty Clay/Clayey Silt Fill** some shale fragments damp to moist		4	SS	46	12	
	3			5	SS	46	16	
		brown, occ. reddish brown trace rootlets						
		trace topsoil		6	SS	25	16	
	4							
166.6		greyish brown						
		brown, occ. greyish brown occ. reddish brown **Silty Clay/Clayey Silt Till** occ. sand seams, occ. oxidized fissures occ. shale fragments damp, hard		7	SS	46	34	
165.8	5							
				8	SS	20	50/13cm	
		reddish brown **Highly Weathered**		9	SS	5	50/5cm	
	6							
		Weathered Shale occ. limestone seams		10	SS	5	50/5cm	
163.9	7							

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH kPa (20 40 60 80 100)

WATER CONTENT (%) (5 15 25 35)

SAMPLE NUMBER	WATER CONTENT (%)
1	10
	14
2	8
3	11
4	10
5	11
6	20
7	12
8	8
9	6
10	5

MONITORING WELL

REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

Borehole was moved 2m west of stake due to Mattamy's existing construction trailer.

RECORD OF BOREHOLE 1W

Project No.: T20799 W | CLIENT: Mattamy Development Corporation | ORIGINATED BY: R.H.

DATE: June 2-3, 2020 | LOCATION: Carding Mill Trail, Oakville, Ontario | COMPILED BY: R.H.

DATUM: Geodetic | BOREHOLE TYPE: Solid Stem | CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

SOIL PROFILE				SAMPLES					DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS				
		End of Borehole Practical Auger Refusal @ 7.1m. Cave-in Depth on Completion: None Groundwater Depth on Completion: Dry Measured Groundwater Level in Installed Standpipe Piezometer on: June 10, 2020: Dry June 17, 2020: Dry										
156.1	8											
	9											
	10											
	11											
	12											
	13											
	14											

RECORD OF BOREHOLE 2W

Project No.: T20799 W | CLIENT: Mattamy Development Corporation | ORIGINATED BY: R.H.

DATE: June 2-3, 2020 | LOCATION: Carding Mill Trail, Oakville, Ontario | COMPILED BY: R.H.

DATUM: Geodetic | BOREHOLE TYPE: Solid Stem | CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS
170.8		Ground Surface						
	0	brown **Silty Clay/Clayey Silt Fill** some granulars, trace rootlets damp		1	SS	30	8	
170.2								
	1			2	SS	36	17	
		grey **Shale Fill** damp		3	SS	46	22	
	2			4	SS	46	26	
		brown, occ. dark brown occ. greyish brown trace rootlets						
167.5	3			5	SS	46	13	
		brown **Silty Clay/Clayey Silt Fill** some shale fragments damp						
166.9								
	4	brown, occ. greyish brown **Silty Clay/Clayey Silt Till** some sand damp, very stiff		6	SS	46	21	
166.0		hard		7	SS	46	43	
	5	reddish brown **Highly Weathered**						
		Weathered Shale		8	SS	5	50/8cm	
164.7	6			9	SS	5	50/5cm	
		End of Borehole Practical Auger Refusal @ 6.2m. Cave-in Depth on Completion: None Groundwater Depth on Completion: Dry Measured Groundwater Level in Installed Standpipe Piezometer on: June 10, 2020: 4.2m June 17, 2020: 4.6m						
163.4	7							

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH kPa
20 40 60 80 100

WATER CONTENT (%)
5 15 25 35

WATER CONTENT (%): 10, 9, 10, 9, 16, 17, 17, 11, 9, 5, 5

MONITORING WELL: June 10, 2020; June 17, 2020

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

RECORD OF BOREHOLE 3W

Project No.: T20799 W | CLIENT: Mattamy Development Corporation | ORIGINATED BY: R.H.

DATE: June 2-3, 2020 | LOCATION: Carding Mill Trail, Oakville, Ontario | COMPILED BY: R.H.

DATUM: Geodetic | BOREHOLE TYPE: Solid Stem | CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
170.6		Ground Surface										
170.1	0	grey **Granular Fill**		1	SS	46	29			2, 11		
		brown **Silty Clay/Clayey Silt Fill**										
	1	trace organic stains damp		2	SS	46	16			11		
				3	SS	46	14			12		
	2	trace rootlets trace topsoil										
167.7				4	SS	46	14			19		
	3	brown, occ. grey **Silty Clay/Clayey Silt Till** some oxidized fissures damp, very stiff to hard		5	SS	46	30			12		
	4	reddish brown some sand seams some shale fragments, hard		6	SS	46	33			12		
166.1		reddish brown, occ. grey **Highly Weathered**		7	SS	10	50/13cm	June 02, 2020		4		
	5	**Weathered Shale**		8	SS	10	50/10cm			11		
		occ. limestone seams										
164.4	6	**End of Borehole**		9	SS	5	50/5cm			11		
		Practical Auger Refusal @ 6.2m. Cave-in Depth on Completion: None Groundwater Depth on Completion: 4.7m										
	7	Measured Groundwater Level in Installed Standpipe Piezometer on: June 10, 2020: 4.1m June 17, 2020: 4.2m										
163.2												

RECORD OF BOREHOLE 4W

Project No.: T20799 W | CLIENT: Mattamy Development Corporation | ORIGINATED BY: R.H.

DATE: June 2-3, 2020 | LOCATION: Carding Mill Trail, Oakville, Ontario | COMPILED BY: R.H.

DATUM: Geodetic | BOREHOLE TYPE: Solid Stem | CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
170.8		Ground Surface										
	0	brown **Silty Clay/Clayey Silt Fill** damp		1	SS	46	14			11		
	1			2	SS	20	25			10		
				3	SS	30	22			12		
	2	brown, occ. dark brown occ. rootlets		4	SS	46	17			12		
	3	greyish brown some rootlets, trace organic stains damp to moist		5	SS	46	12			23		
167.1		brown										
	4	brown, occ. grey occ. reddish brown **Silty Clay/Clayey Silt Till** some sand seams some shale fragments damp, hard		6	SS	46	48			13		
		shale interbedding		7	SS	46	46			11		
	5	brown, occ. reddish brown										
165.6		reddish brown **Highly Weathered**		8	SS	15	50/10cm	June 03, 2020		6		
		Weathered Shale										
164.7	6	**End of Borehole**		9	SS	5	50/5cm			10		
		Practical Auger Refusal @ 6.2m Cave-in Depth on Completion: None Groundwater Depth on Completion: 5.8m										
163.3	7											

RECORD OF BOREHOLE 5W

Project No.: T20799 W | CLIENT: Mattamy Development Corporation | ORIGINATED BY: R.H.

DATE: June 2-3, 2020 | LOCATION: Carding Mill Trail, Oakville, Ontario | COMPILED BY: R.H.

DATUM: Geodetic | BOREHOLE TYPE: Solid Stem | CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
170.5		Ground Surface										
	0	brown **Silty Clay/Clayey Silt Fill** moist		1	SS	46	6			14		
	1	brown, occ. reddish brown some shale fragments damp to moist		2	SS	20	9			15		
				3	SS	20	6			14		
168.3	2	greyish brown **Sandy Silt Till** trace to stone clay occ. oxidized fissures damp to moist, compact		4	SS	46	23			12		
167.3	3	reddish brown **Till-Shale** damp, hard		5	SS	46	42			10 11		
166.8	4	reddish brown **Highly Weathered**		6	SS	46	48			7		
		Weathered Shale occ. limestone seams		7	SS	5	50/10cm			3		
164.4	6	**End of Borehole** Practical Auger Refusal @ 6.1m. Cave-in Depth on Completion: None Groundwater Depth on Completion: Dry		8	SS	5	50/5cm			3		
163.0	7											

RECORD OF BOREHOLE 6W

Project No.: T20799 W | CLIENT: Mattamy Development Corporation | ORIGINATED BY: R.H.

DATE: June 2-3, 2020 | LOCATION: Carding Mill Trail, Oakville, Ontario | COMPILED BY: R.H.

DATUM: Geodetic | BOREHOLE TYPE: Solid Stem | CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
170.7		Ground Surface										
170.3	0	grey **Granular Fill** moist		1	SS	46	13			11, 12		
	1	brown **Silty Clay/Clayey Silt Fill** damp		2	SS	46	13			19		
				3	SS	46	12			20		
	2	brown, occ. reddish brown										
168.1		occ. sand interbeddings		4	SS	46	40			15		
	3	grey **Silty Clay/Clayey Silt Till** occ. shale interbeddings damp, hard		5	SS	41	36			18		
167.1				6	SS	25	50/10cm			13		
	4	reddish brown **Highly Weathered**		7	SS	5	50/5cm			9		
	5	**Weathered Shale** occ. limestone seams		8	SS	5	50/5cm			5		
164.6	6	**End of Borehole** Practical Auger Refusal @ 6.2m. Cave-in Depth on Completion: None Groundwater Depth on Completion: Dry		9	SS	5	50/5cm			6		
163.2	7											

RECORD OF BOREHOLE 7W

Project No.: T20799 W **CLIENT:** Mattamy Development Corporation **ORIGINATED BY:** R.H.

DATE: June 2-3, 2020 **LOCATION:** Carding Mill Trail, Oakville, Ontario **COMPILED BY:** R.H.

DATUM: Geodetic **BOREHOLE TYPE:** Solid Stem **CHECKED BY:** H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS
~171.0		Ground Surface						
	0	brown, occ. dark brown **Silty Clay/Clayey Silt Fill** some shale fragments damp		1	SS	36	31	
		brown, occ. reddish brown		2	SS	46	15	
	1	greyish brown some rootlets, some organic stains						
169.3		greyish brown **Sandy Silt Till** trace to some clay damp, compact		3	SS	46	26	
168.8	2	brown **Silty Clay/Clayey Silt Till** some oxidized fissures damp, hard		4	SS	46	34	
		reddish brown		5	SS	41	67/25cm	
167.6	3	reddish brown, occ. grey **Highly Weathered**		6	SS	15	50/8cm	
	4	**Weathered Shale** occ. limestone seams/ interbeddings		7	SS	5	50/5cm	
	5							
164.9	6	**End of Borehole** Practical Auger Refusal @ 6.1m Cave-in Depth on Completion: None Groundwater Depth on Completion: Dry		8	SS	5	50/5cm	
163.6	7	Measured Groundwater Level in Installed Standpipe Piezometer on: June 10, 2020: Dry June 17, 2020: Dry						

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH kPa ▲ 20 40 60 80 100 ▲

WATER CONTENT (%) 5 15 25 35

WATER CONTENT (%)
9
15
16
11
10
4
6
4
4

MONITORING WELL

REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

Borehole location was moved ~ 2m east of stake due to material storage.

RECORD OF BOREHOLE 8W

Project No.: T20799 W | CLIENT: Mattamy Development Corporation | ORIGINATED BY: R.H.

DATE: June 2-3, 2020 | LOCATION: Carding Mill Trail, Oakville, Ontario | COMPILED BY: R.H.

DATUM: Geodetic | BOREHOLE TYPE: Solid Stem | CHECKED BY: H.S.

SHAD & ASSOCIATES INC.
83 Citation Dr, Unit 9,
Vaughan, Ontario, L4K 2Z6

ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 20 40 60 80 100	WATER CONTENT (%) 5 15 25 35	MONITORING WELL	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
171.6		Ground Surface										
	0	brown **Silty Clay/Clayey Silt Fill** trace gravels damp		1	SS	36	13			11		
	1	trace rootlets trace organic stains		2	SS	36	15			13		
170.3		greyish brown **Silty Clay/Clayey Silt Till** some sand seams some oxidized fissures damp, hard		3	SS	46	27			11		
	2	grey		4	SS	46	42			10		
	3	brown, occ. reddish brown some shale fragments		5	SS	46	36			10		
168.0		reddish brown, occ. grey **Highly Weathered**		6	SS	10	50/8cm			3		
	4			7	SS	5	50/5cm			5		
	5	**Weathered Shale** occ. limestone seams										
165.5	6			8	SS	5	50/5cm			5		
		End of Borehole Practical Auger Refusal @ 6.1m Cave-in Depth on Completion: None Groundwater Depth on Completion: Dry Measured Groundwater Level in Installed Standpipe Piezometer on: June 10, 2020: Dry June 17, 2020: Dry										
164.2	7											

BURNSIDE

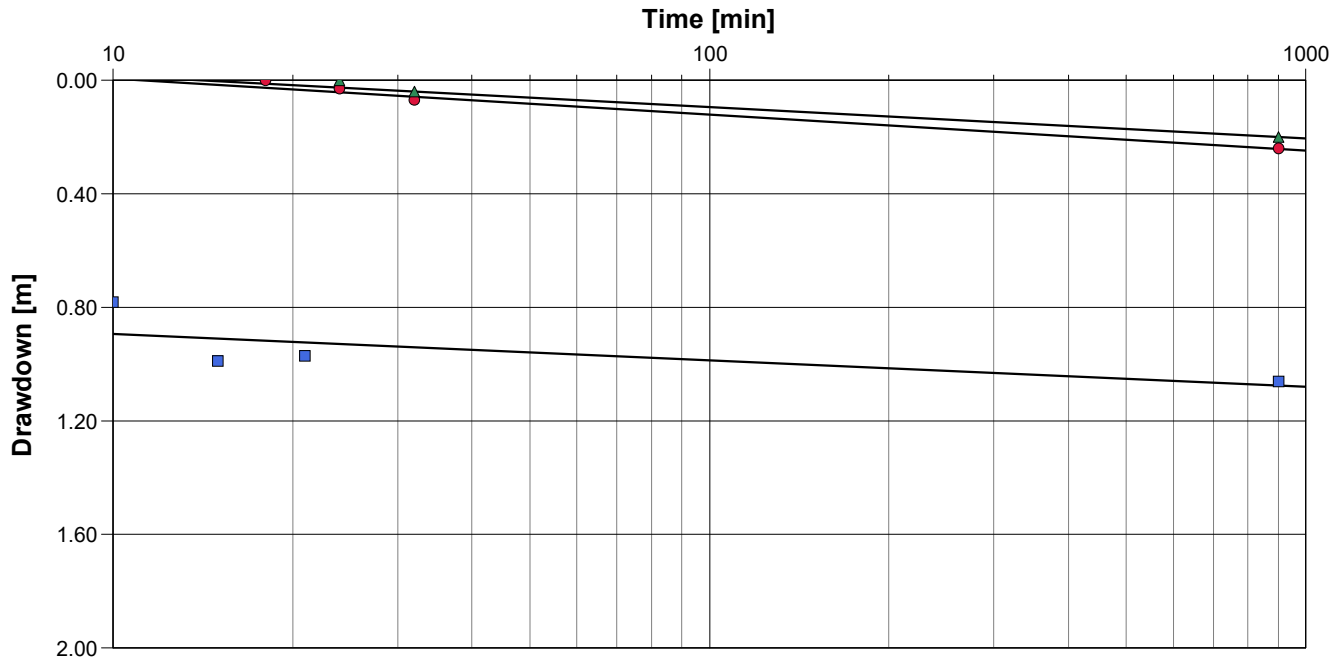
[THE DIFFERENCE IS OUR PEOPLE]

Appendix B

Hydraulic Conductivity

BURNSIDE	**Pumping Test Analysis Report**
	Project: Block 300
	Number: 300054371
	Client: Mattamy

Location: Oakville, ON	Pumping Test: Pumping Test	Pumping Well: Test BH
Test Conducted by: JD		Test Date: 9/21/2023
Analysis Performed by: JD	Jacob Cooper	Analysis Date: 10/20/2023
Aquifer Thickness: 1.00 m	Discharge Rate: 0.06 [m³/min]	

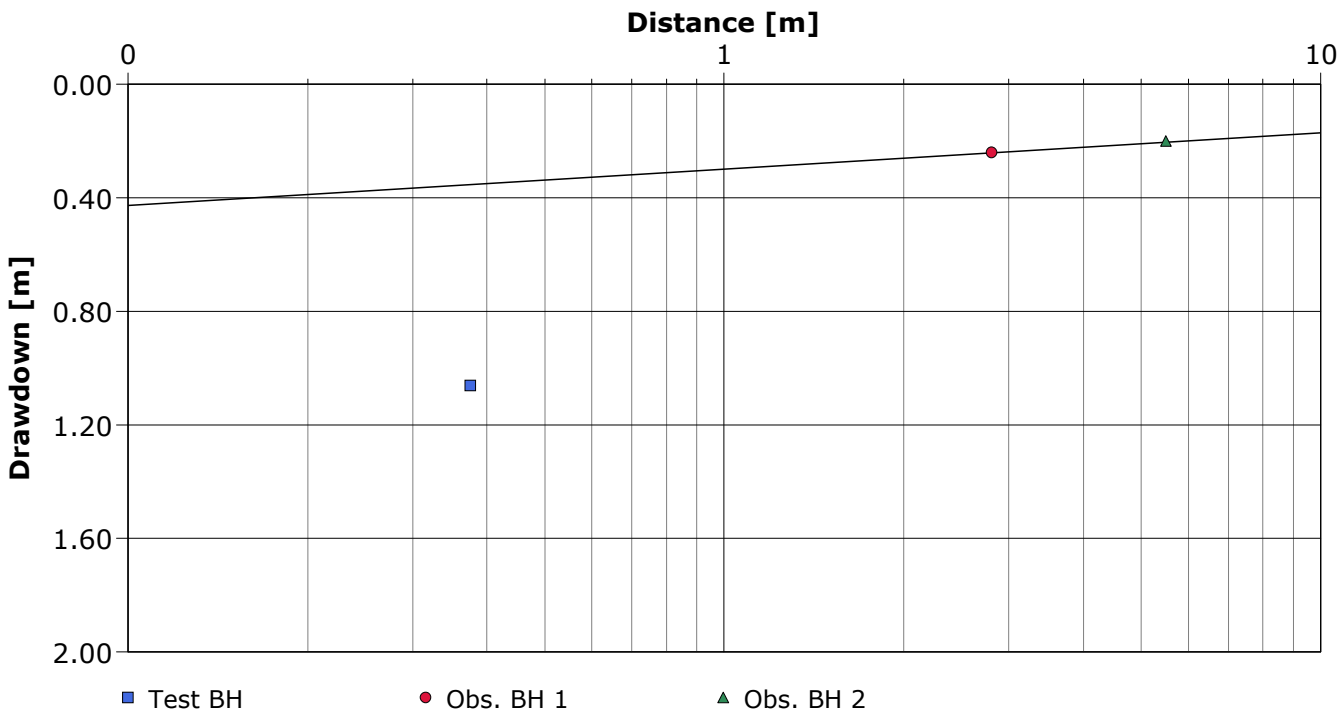


Calculation using COOPER & JACOB

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Storage coefficient	Radial Distance to PW [m]	
Test BH	1.96×10^{-3}	1.96×10^{-3}			
Obs. BH 1	1.44×10^{-3}	1.44×10^{-3}	2.80×10^{-1}	2.8	
Obs. BH 2	1.66×10^{-3}	1.66×10^{-3}	1.03×10^{-1}	5.5	
Average	1.69×10^{-3}	1.69×10^{-3}	1.92×10^{-1}		

BURNSIDE	**Pumping Test Analysis Report**
	Project: Block 300
	Number: 300054371
	Client: Mattamy

Location: Oakville, ON	Pumping Test: Pumping Test	Pumping Well: Test BH
Test Conducted by: JD		Test Date: 9/21/2023
Analysis Performed by: JD	Distance Drawdown	Analysis Date: 10/20/2023
Aquifer Thickness: 1.00 m	Discharge Rate: 0.06 [m³/min]	



Calculation using COOPER & JACOB

	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Storage coefficient	
Point of time [min]: 900	2.87×10^{-3}	2.87×10^{-3}	7.32×10^{-3}	

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix C

Dewatering Estimate

Table C-1
Summary of Groundwater Seepage Estimates
Groundwater Seepage - Radial Flow

Scenario	Foundation Invert m asl	Water Table masl	Seepage Zone Base masl	Seepage Zone Drawdown m	Datum masl	K m/s	B m	H m	h m	R_o m	Width of Building m	Length of Building m	Equivalent Radius (r_s) m	Q confined L/day	Q confined L/min
Block 300 - Foundation Excavation **Regional Conditions**	161.0	168.0	160.0	8.0	161.0	2.0E-07	1.0	7.0	0.0	46.0	81	52	36.6	1,664	1.2
Block 300 - Foundation Excavation **Observed Site Conditions**	161.0	165.5	160.0	5.5	161.0	1.7E-03	1.0	4.5	0.0	593.2	81	52	36.6	745,560	517.8
Block 300 - Foundation Excavation **Permanent Dewatering**	163.0	169.0	162.0	7.0	161.0	2.0E-07	1.0	8.0	1.0	46.0	81	52	36.6	1,664	1.2

Notes:

m	metres
masl	metres above sea level
m/s	metres per second

Seepage assumed to be active to 1 m below the base of the foundation at the foundation drain
Datum is based on average thickness of weathered zone of bedrock
Water table estimated based on recent measurements and historical monitoring data

H is saturated thickness of aquifer before seepage [m];
h is saturated thickness of aquifer under seepage conditions [m];
R_0 is radius of seepage influence [m];
r_s is equivalent radius of pumping well/ seepage [m];
Q is seepage rate [m^3/s];
K is hydraulic conductivity [m/s];
B is the thickness of the confined aquifer [m].

The following equation is relevant in the case of radial flow towards the circular shafts:

Unconfined:

$$Q = \frac{\pi K\left(H^2 - h^2\right)}{\ln\left(\frac{R_0}{r_s}\right)}$$

Confined:
(assumed)

$$Q = \frac{\pi BK\left(H - h\right)}{\ln\left(\frac{R_0}{r_s}\right)}$$

Where:

$R_0 = 3000\ (H\text{-}h)\ K^{0.5} + r_s$

K = the hydraulic conductivity (m/sec)
H = the existing height of the water table (m)
h = the height of the water table after dewatering (m)
R_0 = the lateral extent of drawdown (m)
r_s = $\sqrt{}$ (width of excavtion x length of excavation) /π

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix D

Water Quality

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES
17345 LESLIE STREET
Newmarket, ON L3Y0A4
(905) 953-8967
ATTENTION TO: Melinda Morris
PROJECT: 300055341
AGAT WORK ORDER: 23T011745
TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist
WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer
DATE REPORTED: Apr 13, 2023
PAGES (INCLUDING COVER): 9
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*
- *For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.*

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 23T011745

PROJECT: 300055341

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES

ATTENTION TO: Melinda Morris

SAMPLING SITE:BLOCK 300 OAKVILLE

SAMPLED BY:M. MORRIS

Nonylphenols & Nonylphenol Ethoxylates (HPLC)

DATE RECEIVED: 2023-04-04

DATE REPORTED: 2023-04-13

				SAMPLE DESCRIPTION:	PBH1W	PBH2W
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2023-04-04 12:00	2023-04-04 14:20
Parameter	**Unit**	**G / S**	**RDL**		**4898069**	**4898149**
Nonylphenols	mg/L		0.001		<0.001	<0.001
Nonylphenol Ethoxylates	mg/L		0.01		<0.01	<0.01

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

4898069-4898149 Nonylphenols is a calculated parameter. The calculated value is the sum of Nonylphenol (NP) and 4n-Nonylphenol (4n-NP).
Nonylphenol Ethoxylates is a calculated parameter. The calculated value is the sum of Nonylphenol Monoethoxylate (NP1EO) and Nonylphenol Diethoxylate (NP2EO).
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: N Popnikolof

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 23T011745

PROJECT: 300055341

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES

ATTENTION TO: Melinda Morris

SAMPLING SITE:BLOCK 300 OAKVILLE

SAMPLED BY:M. MORRIS

Sewer Use - Oakville Storm - Organics

DATE RECEIVED: 2023-04-04

DATE REPORTED: 2023-04-13

		SAMPLE DESCRIPTION:		PBH1W	PBH2W
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2023-04-04 12:00	2023-04-04 14:20
Parameter	**Unit**	**G / S**	**RDL**	**4898069**	**4898149**
Oil and Grease (animal/vegetable) in water	mg/L	150	0.5	0.73	1.31
Oil and Grease (mineral) in water	mg/L	15	0.5	0.51	<0.5
Methylene Chloride	mg/L	0.0052	0.0003	<0.0003	<0.0003
trans-1,3-Dichloropropylene	mg/L	0.0056	0.0003	<0.0003	<0.0003
cis- 1,2-Dichloroethylene	mg/L	0.0056	0.0002	<0.0002	<0.0002
Chloroform	mg/L	0.002	0.0002	<0.0002	<0.0002
Benzene	mg/L	0.002	0.0002	<0.0002	<0.0002
Trichloroethylene	mg/L	0.0076	0.0002	<0.0002	<0.0002
Toluene	mg/L	0.002	0.0002	<0.0002	<0.0002
Tetrachloroethylene	mg/L	0.0044	0.0001	<0.0001	<0.0001
Ethylbenzene	mg/L	0.002	0.0002	<0.0002	<0.0002
1,1,2,2-Tetrachloroethane	mg/L	0.017	0.0002	<0.0002	<0.0002
1,2-Dichlorobenzene	mg/L	0.0056	0.0002	<0.0002	<0.0002
1,4-Dichlorobenzene	mg/L	0.0068	0.0002	<0.0002	<0.0002
m & p-Xylene	mg/L		0.0002	<0.0002	<0.0002
o-Xylene	mg/L		0.0001	<0.0001	<0.0001
Xylenes (Total)	mg/L	0.0044	0.0002	<0.0002	<0.0002
Surrogate	**Unit**	**Acceptable Limits**			
Toluene-d8	% Recovery	50-140		112	104
4-Bromofluorobenzene	% Recovery	50-140		83	78

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Oakville Storm Sewer Discharge
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

4898069-4898149 Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopowich

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 23T011745

PROJECT: 300055341

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES

ATTENTION TO: Melinda Morris

SAMPLING SITE:BLOCK 300 OAKVILLE

SAMPLED BY:M. MORRIS

Sewer Use - Oakville Storm Sewer Use By Law - Inorganics

DATE RECEIVED: 2023-04-04

DATE REPORTED: 2023-04-13

		SAMPLE DESCRIPTION:		PBH1W	PBH2W
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2023-04-04 12:00	2023-04-04 14:20
Parameter	Unit	G / S	RDL	4898069	4898149
pH	pH Units	6.5 - 8.5	NA	7.89	7.81
BOD (5)	mg/L	15	2	<2	<2
Cyanide, SAD	mg/L	0.02	0.002	<0.002	<0.002
Phenols	mg/L	0.008	0.001	0.005	0.003
Total Phosphorus	mg/L	0.4	0.02	<0.02	<0.02
Total Suspended Solids	mg/L	15	10	<10	<10
Total Arsenic	mg/L	0.02	0.015	<0.015	<0.015
Total Cadmium	mg/L	0.008	0.005	<0.005	<0.005
Total Chromium	mg/L	0.08	0.020	<0.020	<0.020
Chromium VI	mg/L	0.04	0.002	<0.002	<0.002
Total Copper	mg/L	0.04	0.020	<0.020	<0.020
Total Lead	mg/L	0.12	0.020	<0.020	<0.020
Total Manganese	mg/L	0.05	0.020	<0.020	<0.020
Total Mercury	mg/L	0.0004	0.0002	<0.0002	<0.0002
Total Nickel	mg/L	0.08	0.030	<0.030	<0.030
Total Selenium	mg/L	0.02	0.002	<0.002	<0.002
Total Silver	mg/L	0.12	0.020	<0.020	<0.020
Total Zinc	mg/L	0.04	0.020	<0.020	<0.020

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Oakville Storm Sewer Discharge
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES

AGAT WORK ORDER: 23T011745

PROJECT: 300055341

ATTENTION TO: Melinda Morris

SAMPLING SITE:BLOCK 300 OAKVILLE

SAMPLED BY:M. MORRIS

Trace Organics Analysis

RPT Date: Apr 13, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Sewer Use - Oakville Storm - Organics															
Oil and Grease (animal/vegetable) in water	4883505		< 0.5	< 0.5	NA	< 0.5	114%	70%	130%	107%	70%	130%	106%	70%	130%
Oil and Grease (mineral) in water	4883505		< 0.5	< 0.5	NA	< 0.5	84%	70%	130%	87%	70%	130%	83%	70%	130%
Methylene Chloride	4885208		<0.0003	<0.0003	NA	< 0.0003	113%	50%	140%	113%	60%	130%	107%	50%	140%
trans-1,3-Dichloropropylene	4885208		<0.0003	<0.0003	NA	< 0.0003	79%	50%	140%	77%	50%	140%	73%	50%	140%
cis- 1,2-Dichloroethylene	4885208		<0.0002	<0.0002	NA	< 0.0002	102%	50%	140%	99%	50%	140%	89%	50%	140%
Chloroform	4885208		<0.0002	<0.0002	NA	< 0.0002	108%	50%	140%	110%	60%	130%	97%	50%	140%
Benzene	4885208		<0.0002	<0.0002	NA	< 0.0002	100%	50%	140%	98%	60%	130%	82%	50%	140%
Trichloroethylene	4885208		<0.0002	<0.0002	NA	< 0.0002	91%	50%	140%	87%	60%	130%	72%	50%	140%
Toluene	4885208		<0.0002	<0.0002	NA	< 0.0002	100%	50%	140%	102%	60%	130%	81%	50%	140%
Tetrachloroethylene	4885208		<0.0001	<0.0001	NA	< 0.0001	74%	50%	140%	85%	50%	140%	96%	50%	140%
Ethylbenzene	4885208		<0.0002	<0.0002	NA	< 0.0002	99%	50%	140%	102%	60%	130%	74%	50%	140%
1,1,2,2-Tetrachloroethane	4885208		<0.0002	<0.0002	NA	< 0.0002	113%	50%	140%	102%	60%	130%	101%	50%	140%
1,2-Dichlorobenzene	4885208		<0.0002	<0.0002	NA	< 0.0002	106%	50%	140%	106%	60%	130%	86%	50%	140%
1,4-Dichlorobenzene	4885208		<0.0002	<0.0002	NA	< 0.0002	112%	50%	140%	119%	60%	130%	93%	50%	140%
m & p-Xylene	4885208		<0.0002	<0.0002	NA	< 0.0002	102%	50%	140%	107%	60%	130%	81%	50%	140%
o-Xylene	4885208		<0.0001	<0.0001	NA	< 0.0001	109%	50%	140%	111%	60%	130%	90%	50%	140%

Certified By: N Popnikolof

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES

AGAT WORK ORDER: 23T011745

PROJECT: 300055341

ATTENTION TO: Melinda Morris

SAMPLING SITE:BLOCK 300 OAKVILLE

SAMPLED BY:M. MORRIS

Water Analysis

RPT Date: Apr 13, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Sewer Use - Oakville Storm Sewer Use By Law - Inorganics															
pH	4898895		7.88	7.90	0.3%	NA	100%	90%	110%						
BOD (5)	4895899		<2	<2	NA	< 2	102%	75%	125%						
Cyanide, SAD	4898206		<0.002	<0.002	NA	< 0.002	107%	70%	130%	103%	80%	120%	101%	70%	130%
Phenols	4898643		0.002	0.001	NA	< 0.001	99%	90%	110%	99%	90%	110%	101%	80%	120%
Total Phosphorus	4896460		0.10	0.10	NA	< 0.02	102%	70%	130%	107%	80%	120%	98%	70%	130%
Total Suspended Solids	4898206		12	10	NA	< 10	98%	80%	120%						
Total Arsenic	4897315		0.021	0.021	NA	< 0.015	100%	70%	130%	98%	80%	120%	101%	70%	130%
Total Cadmium	4897315		<0.005	<0.005	NA	< 0.005	102%	70%	130%	102%	80%	120%	99%	70%	130%
Total Chromium	4897315		<0.020	<0.020	NA	< 0.020	97%	70%	130%	94%	80%	120%	109%	70%	130%
Chromium VI	4896029		0.112	0.110	1.3%	< 0.002	101%	70%	130%	102%	80%	120%	NA	70%	130%
Total Copper	4897315		<0.020	<0.020	NA	< 0.020	96%	70%	130%	93%	80%	120%	97%	70%	130%
Total Lead	4897315		<0.020	<0.020	NA	< 0.020	98%	70%	130%	89%	80%	120%	83%	70%	130%
Total Manganese	4897315		0.450	0.445	1.2%	< 0.020	100%	70%	130%	95%	80%	120%	98%	70%	130%
Total Mercury	4898069	4898069	<0.0002	<0.0002	NA	< 0.0002	100%	70%	130%	97%	80%	120%	98%	70%	130%
Total Nickel	4897315		<0.030	<0.030	NA	< 0.030	97%	70%	130%	93%	80%	120%	100%	70%	130%
Total Selenium	4897315		0.071	0.082	14.7%	< 0.002	99%	70%	130%	98%	80%	120%	96%	70%	130%
Total Silver	4897315		<0.020	<0.020	NA	< 0.020	102%	70%	130%	96%	80%	120%	94%	70%	130%
Total Zinc	4897315		0.184	0.169	8.4%	< 0.020	102%	70%	130%	96%	80%	120%	96%	70%	130%

Comments: NA signifies Not Applicable.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.
Matrix spike: Spike level < native concentration. Matrix spike acceptance limits do not apply.

Certified By: Iris Verástegui

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES

AGAT WORK ORDER: 23T011745

PROJECT: 300055341

ATTENTION TO: Melinda Morris

SAMPLING SITE:BLOCK 300 OAKVILLE

SAMPLED BY:M. MORRIS

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Nonylphenols	ORG-91-5122	modified ASTM D7485-16	CALCULATION
Nonylphenol Ethoxylates	ORG-91-5122	modified ASTM D7485-16	CALCULATION
Oil and Grease (animal/vegetable) in water	VOL-91-5011	EPA SW-846 1664A & SM 5520	GRAVIMETRIC
Oil and Grease (mineral) in water	VOL-91-5011	EPA SW-846 1664A & SM 5520	GRAVIMETRIC
Methylene Chloride	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
trans-1,3-Dichloropropylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
cis- 1,2-Dichloroethylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Chloroform	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Trichloroethylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Toluene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
m & p-Xylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
o-Xylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Xylenes (Total)	VOL-91-5001	modified from EPA 5030B & EPA 8260D	CALCULATION
Toluene-d8	VOL-91- 5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91- 5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: R.J. BURNSIDE & ASSOCIATES

AGAT WORK ORDER: 23T011745

PROJECT: 300055341

ATTENTION TO: Melinda Morris

SAMPLING SITE:BLOCK 300 OAKVILLE

SAMPLED BY:M. MORRIS

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
BOD (5)	INOR-93-6006	Modified from SM 5210 B	DO METER
Cyanide, SAD	INOR-93-6051	modified from MOECC E3015; SM 4500-CN- A, B, & C	TECHNICON AUTO ANALYZER
Phenols	INOR-93-6072	modified from SM 5530 D	LACHAT FIA
Total Phosphorus	INOR-93-6022	modified from SM 4500-P B and SM 4500-P E	SPECTROPHOTOMETER
Total Suspended Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Total Arsenic	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cadmium	MET -93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Chromium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Chromium VI	INOR-93-6073	modified from SM 3500-CR B	LACHAT FIA
Total Copper	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Lead	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Manganese	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Mercury	MET-93-6100	modified from EPA 245.2 and SM 3112 B	CVAAS
Total Nickel	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Selenium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Silver	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zinc	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 23T011745

Cooler Quantity: 2 large

Arrival Temperatures: 7.1 | 7.4 | 7.9
6.4 | 6.5 | 7.1

Custody Seal Intact: ☐ Yes ☐ No ☒ N/A

Notes: loose ice

Report Information:

Company: RJ Burnside + Associates Limited
Contact: Melinda Morris
Address: 7345 Leslie St Newmarket ON L3Y 0A4
Phone: 289-264-6765 Fax:
Reports to be sent to:
1. Email: melinda.morris@rjburnside.com
2. Email: Dwight.smickle@rjburnside.com

Regulatory Requirements:

(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Excess Soils R406
Table (Indicate One)

☐ Regulation 558

☐ CCME

☒ Sewer Use ☐ Sanitary ☒ Storm
Oakville (Region)

☐ Prov. Water Quality Objectives (PWQO)

☐ Other
(Indicate One)

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
*TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 300055341
Site Location: Block 300 Oakville
Sampled By: M. Morris
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a **Record of Site Condition?** ☐ Yes ☒ No

Report Guideline on *Certificate of Analysis* ☒ Yes ☐ No

Invoice Information:

Bill To Same: Yes ☒ No ☐

Company:
Contact:
Address:
Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC (Y/N)	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs	PAHs	PCBs	VOC	Aroclors	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach ☐ Metals ☐ VOCs ☐ SVOCs	Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Corrosivity: Include Moisture ☐ Sulphide ☐	Oakville Storm Sewer Use	Potentially Hazardous or High Concentration (Y/N)
DBH1W	4/4/23	12:00 AM/PM	15	GW	\	N												X	
DBH2W	4/4/23	2:20 AM/PM	15	GW	\	N												X	
		AM/PM			Note: only 15 bottles filled for each sample set limited water - disregard other parameters														
		AM/PM																	
		AM/PM																	
		AM/PM																	
		AM/PM																	
		AM/PM																	
		AM/PM																	
		AM/PM																	
		AM/PM																	

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Melinda Morris,	4/4/23	3:50	T. Persad	Apr 4	3:47pm

Page ____ of ____

No: T - 143162

R.J. Burnside & Associates Limited