

HARDEN ENVIRONMENTAL SERVICES LIMITED

**Hydrogeological Assessment
Storm Water Management Pond Retrofit
North District Road Maintenance Facility
3525 Baseline Road, Sutton, Ontario**

Prepared For:

York Region:

**Corporate Services Department and
Public Services Department**

September 28, 2022

Harden Ref. No. 2220



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1.0 INTRODUCTION

1.1 BACKGROUND

The purpose of this report is to provide a hydrogeological assessment for a proposed storm water management pond retrofit at 3525 Baseline Road in Sutton, Ontario (Figure 1). There are two ponds located at the site as shown on Figure 2. McMinnows Pond will be excavated to increase depth of water storage and Baseline Pond will be enlarged through minor excavation and the construction of perimeter berms.

2.0 PHYSICAL SETTING

2.1 SITE DESCRIPTION AND SURROUNDING LAND USE

The Site is currently used by York Region as a maintenance yard. Surrounding land use is rural, mainly comprising cash crop farmland. The York Region Police have a facility east of the site and there is an outdoor storage business located west of the site. Environmental features in the area are shown on Figure 3. There are no provincially significant wetlands located near the site. Several small unevaluated wetlands are located near the site both isolated and associated with small tributary. The site is located 2400 metres south of Lake Simcoe.

2.2 PHYSIOGRAPHY AND QUATERNARY GEOLOGY

Chapman and Putnam (1984) describe the area of the Site as being drumlinized till plains within the Simcoe Lowlands. This area is typified as being relatively flat laying plains and there are no prominent drumlins nearby. The Ontario Geological Survey (Figure 4) mapping has this area underlain by the silty sand to sandy silt Newmarket Till sheet.

2.3 TOPOGRAPHY AND DRAINAGE

The site elevations range from 255 m AMSL at the southwest end of the site to 249 m AMSL at the northeast end of the site along Baseline Road. A small tributary to Lake Simcoe is located along the southern and eastern edges of the site. There are roadside ditches along Baseline Road. Surface water flow in the ditch is eastward. The ditch was dry and grassy when inspected in July of 2022.

2.4 CLIMATE

Annual precipitation for this Site is estimated to be 878 mm/year and the evapotranspiration at this Site is estimated to be 594 mm/year as stated in the *Lake Simcoe Climate Data: A Reference Document to Support the Completion of Water Balance Assessments* prepared by the Lake Simcoe Region Conservation Authority.

The surplus water (Precipitation – Evapotranspiration) available for runoff or infiltration is therefore estimated to be 299 mm/year.

2.5 LAKE SIMCOE REGION CONSERVATION AUTHORITY (LSRCA) REGULATED AREAS

LSRCA Regulated areas are shown on Figure 5. The LSRCA regulates a portion of the southeastern boundary of the site but not the McMinnow Pond or Baseline Pond.

3.0 SITE INVESTIGATION

3.1 FIELD METHODOLOGY

The field work undertaken by Harden Environmental Services Ltd. included the following;

- the developing of three existing groundwater monitors by purging with Waterra pump,
- the hydraulic conductivity testing of the three groundwater monitors,
- measuring water levels of groundwater monitors
- obtaining water quality samples from BH1 and McMinnow Pond.

3.1.1 GEOLOGICAL INVESTIGATION

Three boreholes for geotechnical purposes with monitoring well installations were supervised by Sola Engineering in August 2021. The borehole logs are found in Appendix A. Table 1 summarizes the geological conditions. Monitoring locations are shown on Figure 6.

Table 1: Summary of Geological Observations in Boreholes

Borehole	Depth From (mbgs)	Depth To (mbgs)	Description
BH1	0	2.3	Probable Fill
	2.3	3.8	Clay Silt Till
	3.8	4.3	Sandy Silt Till
BH2	0	1.5	Probable Fill
	1.5	3.8	Clay Silt / Clay Silt Till
	3.8	4.3	Sandy Silt Till
BH3	0	1.1	Fill
	1.1	2.3	Clay Silt
	2.3	3.8	Sandy Silt Till
	3.8	4.3	Silt

The geological descriptions generally match that of the expected Newmarket Till.

3.1.2 GROUNDWATER MONITOR INSTALLATION AND WATER LEVEL MEASUREMENTS

51 mm PVC piezometers were installed in BH1, BH2, and BH3. Details of monitor installations are found in Table 2.

Table 2: Monitor Installation Details

Monitor	Ground Elevation (m AMSL)	Reference Point Elevation (m AMSL)	Piezometer Depth (mbtoc)	Piezometer Depth (mbgs)	Stick-up (m)	ID (mm)	Screen Length (m)
BH1	250.500	251.480	3.90	2.92	0.98	51	1.52
BH2	252.500	253.400	3.80	2.90	0.90	51	1.52
BH3	253.400	254.260	3.80	2.94	0.86	51	1.52

Water levels were recorded on two occasions using an electric water level tape as summarized in Table 3 and Table 4.

Table 3: Groundwater Levels below Ground Surface

Monitor	19-Aug-21	19-Jul-22
	m bgs	m bgs
BH1	1.43	1.06
BH2	0.95	0.80
BH3	1.12	0.93

Table 4: Groundwater Elevation (m AMSL)

Monitor	19-Aug-21	19-Jul-22
	m AMSL	m AMSL
BH1	249.07	249.44
BH2	251.55	251.70
BH3	252.28	252.48

In addition, York Region installed data loggers in BH1, BH2 and BH3 (designated as MW1, MW2 and MW3 by York Region) commencing April 12, 2022. The period of record is shown on the

hydrograph on Figure 7. The period of record includes the seasonal high occurring on June 12, 2022.

3.1.3 HYDRAULIC CONDUCTIVITY TESTING

Hydraulic conductivity tests were conducted in each of the three monitoring wells at the Site. The test conducted in BH2 did not produce acceptable results. Rising head tests were conducted in the groundwater monitors and evaluated using the Hvorslev analytical solution. Table 5 summarizes the results of the testing and recovery curves are found in Appendix B.

Table 5: Hydraulic Testing Results

Monitor	k (metres/second)
BH1	4.1×10^{-7}
BH3	2.2×10^{-6}

The hydraulic conductivity of the soils ranges from 2.2×10^{-6} m/s to 4.1×10^{-7} m/s and the range is indicative of the heterogeneous fill materials these monitors are completed in. The mean hydraulic conductivity is 9.5×10^{-7} m/s.

3.1.4 WATER QUALITY

Two water samples were obtained. Water samples were obtained from BH1 as representative of potential groundwater inflow to the pond and also from McMinnow Pond. The water samples were compared to the York Region Stormwater criteria listed in Bylaw 2021-56. The samples were obtained on July 19, 2022 and delivered the same day to AGAT Laboratories in Mississauga. The samples were kept cool enroute to the laboratory. The results are found in Appendix D.

Table 6: Water Quality Field Measurements July 19, 2022

Station	pH	Temperature C	TDS (mg/L)	EC(u S)
McMinnow Pond	8.31	31.0	1145	2302
BH1	6.06	15.1		>4000

It is found that the water in McMinnow Pond is suitable for discharge to a stormwater ditch. The groundwater obtained from BH1 is not suitable for direct discharge to a stormwater ditch. The groundwater exceeded the criteria for manganese, phenols and total suspended solids.

Manganese is a common element that is found in groundwater in a reduced state and often precipitates in aerobic environments. Thus, as groundwater discharges to the pond, it is likely that the manganese will precipitate out of solution. The total suspended solids in the borehole is due to agitation of water within the borehole and a result of poor overall development of the groundwater monitor. Any discharge from the pond will have to be filtered for suspended solids in any event. The concentration of Phenols is 0.009 mg/L compared to the criteria of 0.008 mg/L. Phenols were not detected in the pond water. Phenols are volatile and it is likely that as groundwater discharges to the pond that the phenols will volatilize.

4.0 DEWATERING

There are two aspects to the dewatering, first the initial draining of the pond and secondly the continuous inflow of groundwater.

The estimated pond volume is 675 m³ (675,000 L) and as this volume is removed, the inflow of groundwater will increase.

It is proposed to excavate McMinnows Pond to an elevation of 249.90 m AMSL. The proposed permanent pool elevation in the pond is 252.10 m AMSL. This also happens to be the average groundwater elevation between BH2 and BH3 located upgradient and downgradient of the pond. The datalogger water level data obtained from BH2 and BH3 peak on June 12, 2022. The average high water level between BH2 (252.2 m AMSL) and BH3(253.2m AMSL) on that date is 252.70 m AMSL, therefore the potential high-water level in McMinnows Pond is 252.70 m AMSL. We will also assume that the pond will be dewatered to 1.0 metres below the final elevation of 249.90 m AMSL. Thus, the dewatered elevation will be 248.90 m AMSL. The pond presently has an area of approximately 450 m² and an average depth of 1.5 metres in springtime conditions.

The volume of groundwater seepage into the pond is estimated using the Dupuit-Forchheimer discharge formula (Bear, 1979);

$$Q = k (H^2 - h^2) / 0.733 \text{ Log } (R/R_e)$$

Where

Q – groundwater inflow into the excavation (m³/s)

k – hydraulic conductivity (m/s)

H – initial thickness of saturated soils above impermeable datum (m)

h – dewatered thickness of saturated soils above impermeable datum (m)

R – estimated radius of influence (m)

R_e – equivalent radius of excavation

Radius of Influence from Edge of Excavation

The radius of influence is estimated using the Sieharddt empirical formula of

$$R_x = 3000 h \sqrt{k}$$

Equivalent Radius of Excavation

Groundwater Flow into the excavation using Equation (1) is radial and since excavations are generally square or rectangular, an equivalent circle of the same area of excavation is required. This is determined using;

$$R_e = \sqrt{L \times W / \pi}$$

For the purpose of the estimate, we assumed that horizontal flow prevails. Furthermore, for the purpose of the calculations it was assumed that the thickness of the water bearing unit is 15 metres.

Final Radius of Influence

The radius of influence(R) used in Equation 1 is the sum of R_x and R_e.

Base of Aquifer

Radial groundwater flow into the pond occurs above an established datum. This datum is determined as an impermeable boundary within the till unit estimated to be 15 metres below the lowest level of dewatering.

Hydraulic Conductivity

The measured hydraulic conductivity of the fill material as high as 2.2×10^{-6} m/s.

In summary, the assumptions used for the Dupuit equation are as follows;

Length of Excavation (L) 30 m

Width of Excavation (W) 18 m

Hydraulic Conductivity (k) = 2.2×10^{-6} m/s

Initial saturated thickness above datum = 15 m (high water levels)

Final saturated thickness above datum = 10.8 m

Estimated radius of influence from edge of pond = 17 m

The estimated seasonal inflow from the sediments to the pond is estimated to be 92.6 m³/day. Given the assumptions and including a safety factor of 3, the estimated long-term inflow of

groundwater along the perimeter walls will be 278 m³/day. The calculation is shown in Appendix D.

5.0 DISCUSSION

An Environmental Activity Sector Registry will be suitable for the dewatering of the pond. The estimated discharge is less than 400,000 L/day. The estimated pond volume is 675 m³ (675,000 L) and therefore in order to have a discharge of less than 400,000 L/day, the pond will initially have to be emptied over more than one day. During construction it is estimated that maintenance pumping of 278,000 L/day will be required.

Anticipated zone of influence

It is anticipated that the zone of influence will be less than 17 metres from the pond edge.

Analysis of potential impact of the soil settlement

During construction it must be anticipated that the edge of the pond will be unstable below an elevation of 252.7 m AMSL (high groundwater elevation). Given the relatively short period of time required for the retrofit (weeks to months) it is unlikely that the silty clay soils within 17 m of the pond will compress to any significant degree. Therefore, other than destabilizing conditions at the edge of the excavation, no soil settlement is anticipated.

Analysis of potential impact to other water users

The nearest private well is located at 3504 Baseline Road, immediately north of the site. This well is outside of the potential zone of influence of the dewatering. This farm is serviced by a well that is 27 metres deep with a static water level of three metres. Thus, there are more than twenty metres of available drawdown in the well. There are more than twenty metres of clay till above the well screen that protects the water supply. The dewatering of the McMinnow Pond will not affect quality or quantity of water in the well.

The on-site well and the well servicing the outdoor storage business west of the site are both 80 metres deep and thus will not be affected by the proposed dewatering. These wells are also beyond the potential zone of influence of the dewatering.

Contingency plan and includes measures to address all identified impacts

The proposed dewatering will occur 175 metres from Baseline Road and 200 metres from the tributary located in the southeast area of the site. There are no private residences within 220 m of the McMinnow Pond. All of these features are beyond the anticipated area of influence of the dewatering. No impacts are anticipated.

Protocol for providing written notice to other water users

There is no necessity to provide written notice to local private water well users as they are well beyond the area of influence of the water taking and their wells cannot be impacted either from water quality or quantity. We have provided a sample notification that should be sent to the Lake Simcoe Region Conservation Authority and the Town of Georgina (Appendix F).

Determination for the need of a water monitoring plan

There is no need for a water monitoring plan because there are no anticipated impacts to either private water well supply or the natural environment. The zone of influence is limited in distance and does not extend to any private well or natural feature. However, a nearby groundwater monitor (BH3) does have a data logger that will be maintained throughout the retrofit period. The data from the logger can be accessed and checked against historical conditions should a question of impacts arise.

Description of the water taking activity

A 450 m² pond located on York Region property will be emptied by mechanical means (pumped) and discharge water directed into a temporary holding area and then allowed to discharge into the municipal ditch on the south side of Baseline Road (Figure 8)

Description of the construction site and project activities

The construction site includes McMinnows Pond which is protected by a perimeter fence. The pond will be dewatered and deepened with an excavator. A discharge plan is included in Appendix F.

Summary of the qualifications and experience of the person preparing the report

This report was prepared by Stan Denhoed, a professional engineer in registered in Ontario and who is also a hydrogeologist with 36 years of experience. Mr. Denhoed's resume is found in Appendix G.

6.0 CONCLUSIONS

- 1) The rate of groundwater discharge into the pond is estimated to be 278,000 liters per day. An EASR should be registered with the Ministry of the Environment, Conservation and Parks. The dewatering rate in the EASR need not exceed 400,000 L/day.
- 2) There are no local residences or wells within the area of influence of the proposed dewatering. There will be no impact to quality or quantity of water available to any private well.
- 3) There will be no impact to any natural feature on or off-site.
- 4) The water quality is suitable for direct discharge to the municipal ditch, however, the concentration of suspended solids may increase during construction and measures to limit suspended solids in the discharge water must be considered.

7.0 STATEMENT OF LIMITATIONS

Harden Environmental Services Ltd. (HESL) conducted the work associated with this report in accordance with the scope of services, time and budget limitations imposed for this work. The work has been conducted according to reasonable and generally accepted local standards for an environmental consultant at the time of the work. No other warranty or representation, expressed or implied, is included or intended in this report.

It should be noted that subsurface conditions might vary at locations and depths other than those locations where borings, surveys or explorations were made by HESL or others. Should conditions, not observed during the work, become apparent, HESL should be immediately notified to assess the situation and conduct additional work, where required. The findings of this report are based on conditions as they were observed at the time of the work. No assurance is made regarding changes in conditions subsequent to the time of the work.

Regulatory statutes are subject to interpretation. These statutes and their interpretation may change over time, thus these issues should be reviewed with appropriate legal counsel.

HESL relied on information provided by others in this report. HESL cannot guarantee the accuracy, completeness and reliability of the information provided by others, although HESL staff attempted to seek clarification on information provided and verified authenticity, where practical. The report and its attachments were prepared for and made available for the sole use of the client. HESL will not be responsible for any use or interpretation of the information contained in this report by any other party without the prior expressed written consent of HESL.

8.0 REFERENCES AND OTHER SUPPORTING DOCUMENTS

Chapman, J.L. and Putman, D.F., 1984, The Physiography of Southern Ontario

Lake Simcoe Region Conservation Authority, April 2017. Lake Simcoe Climate Data: A reference Document to Support the Completion of Water Balance Assessments.

York Region Official Plan 2016 Map 6, Wellhead Protection Areas, www.york.ca

Sola Engineering, Geotechnical Investigation North District Patrol Facility Storm Water Management, Report No. 10868-S0221-GEO, dated November 19, 2021

All of Which is Respectfully Submitted,
Harden Environmental Services Ltd.



Stan Denhoed, M.Sc., P. Eng.
Senior Hydrogeologist



Source: MNR



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Services Ltd.

Project No: 2220

Date: July 2022

Drawn By: AR

Hydrogeological Assessment
3525 Baseline Road

Town of Georgina, Regional Municipality of York
NORTH GWILLIMBURY CON 5 LOT 23

Figure 1: Site Location



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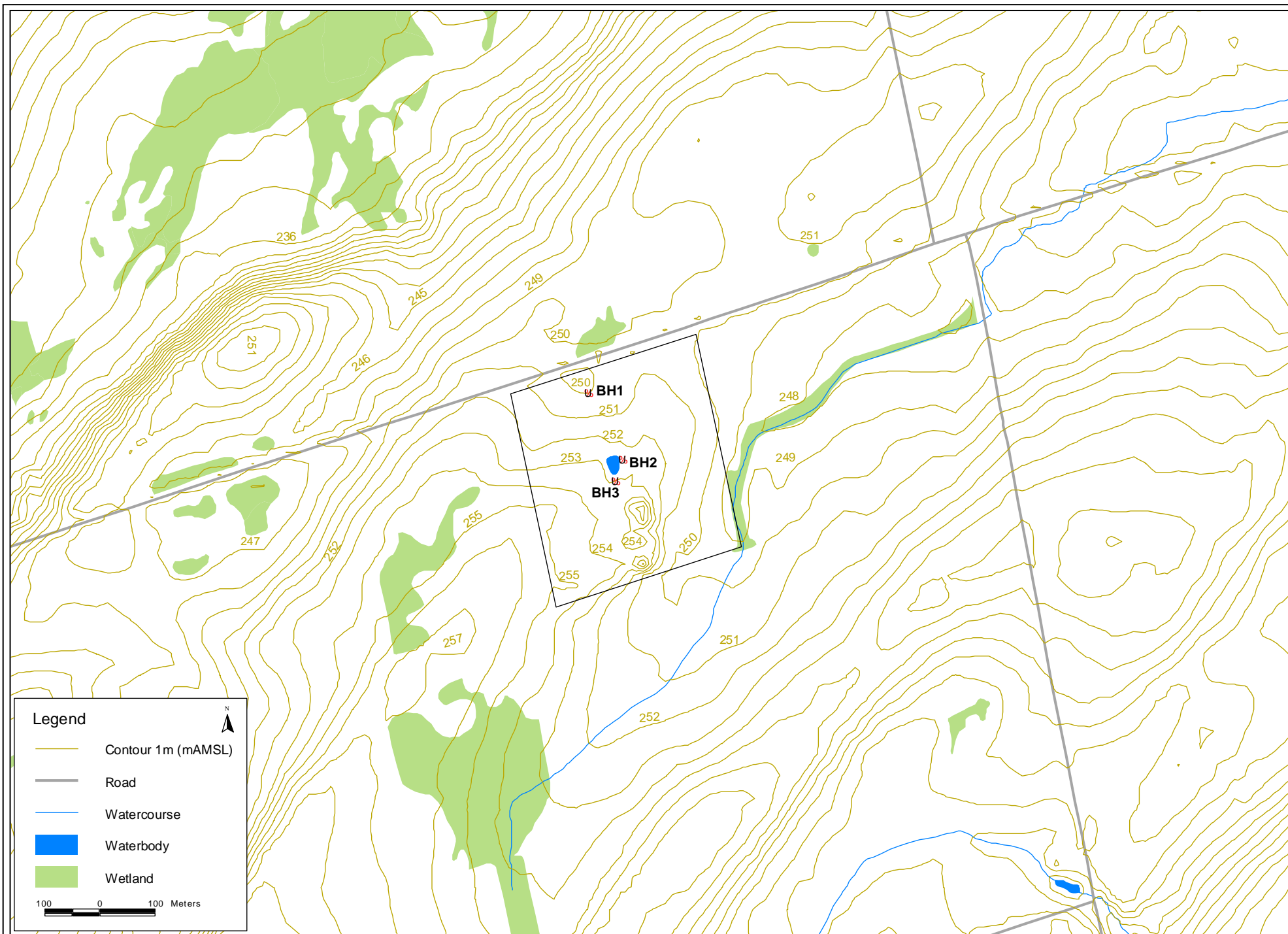
Date: July 2022

Drawn By: AR

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3525 Baseline Road

Town of Georgina, Regional Municipality of York
NORTH GWILLIMBURY CON 5 LOT 23

Figure 2: Aerial Imagery



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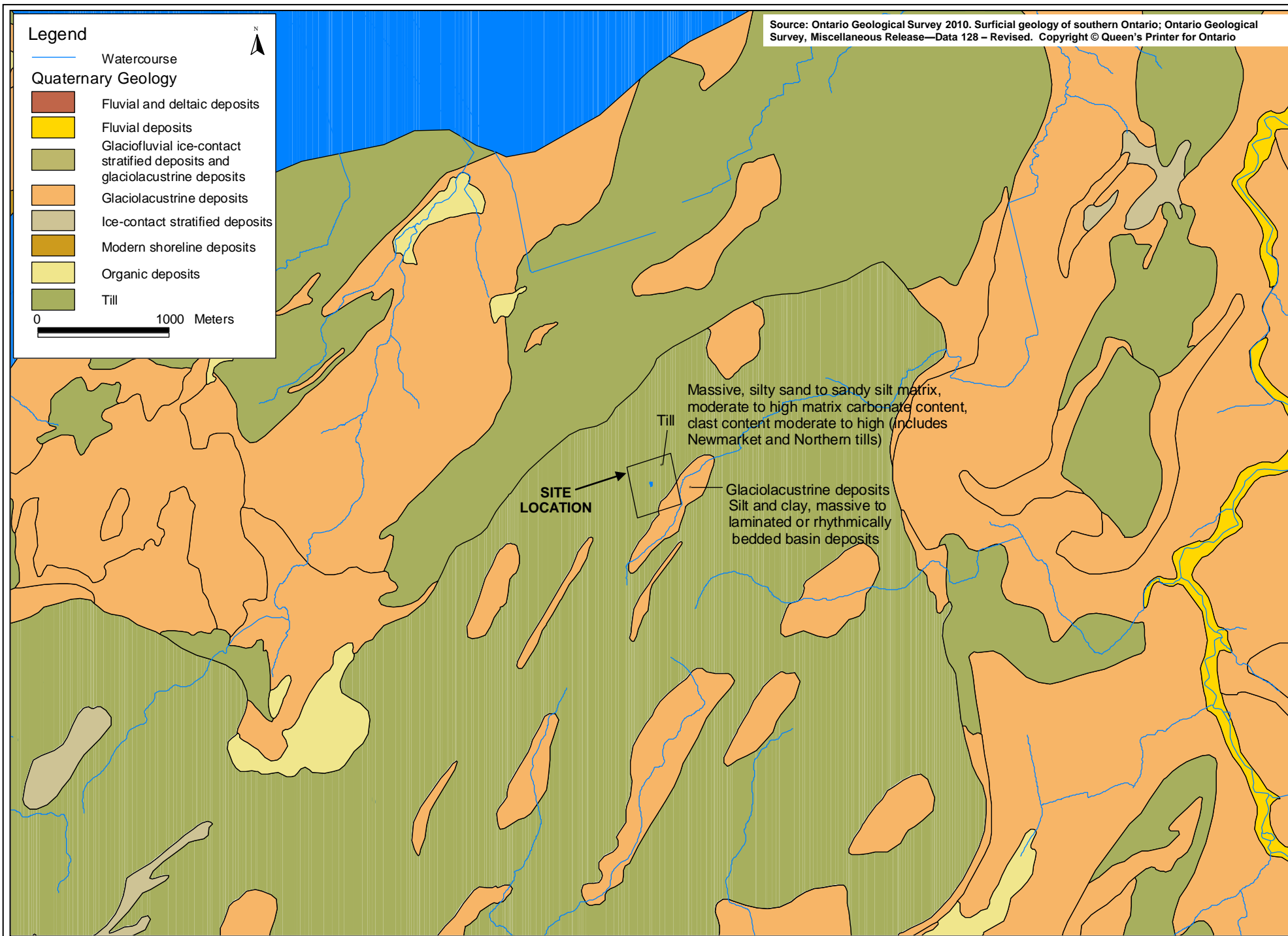
Date: July 2022

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3525 Baseline Road

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Figure 3: Environmental Features



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3525 Baseline Road

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Figure 4: Quaternary Geology

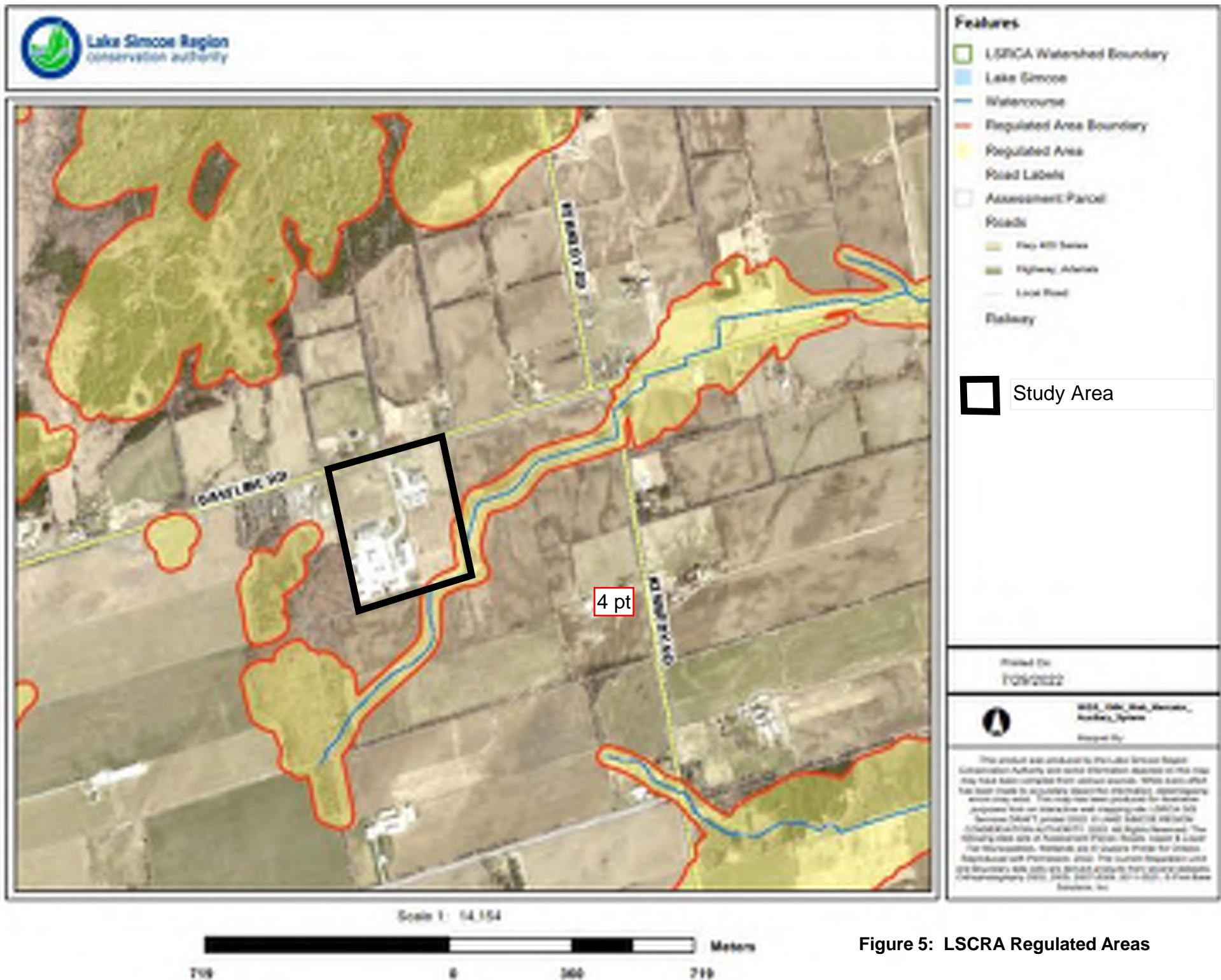


Figure 5: LSCRA Regulated Areas



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Project No: 2220

Date: July 2022

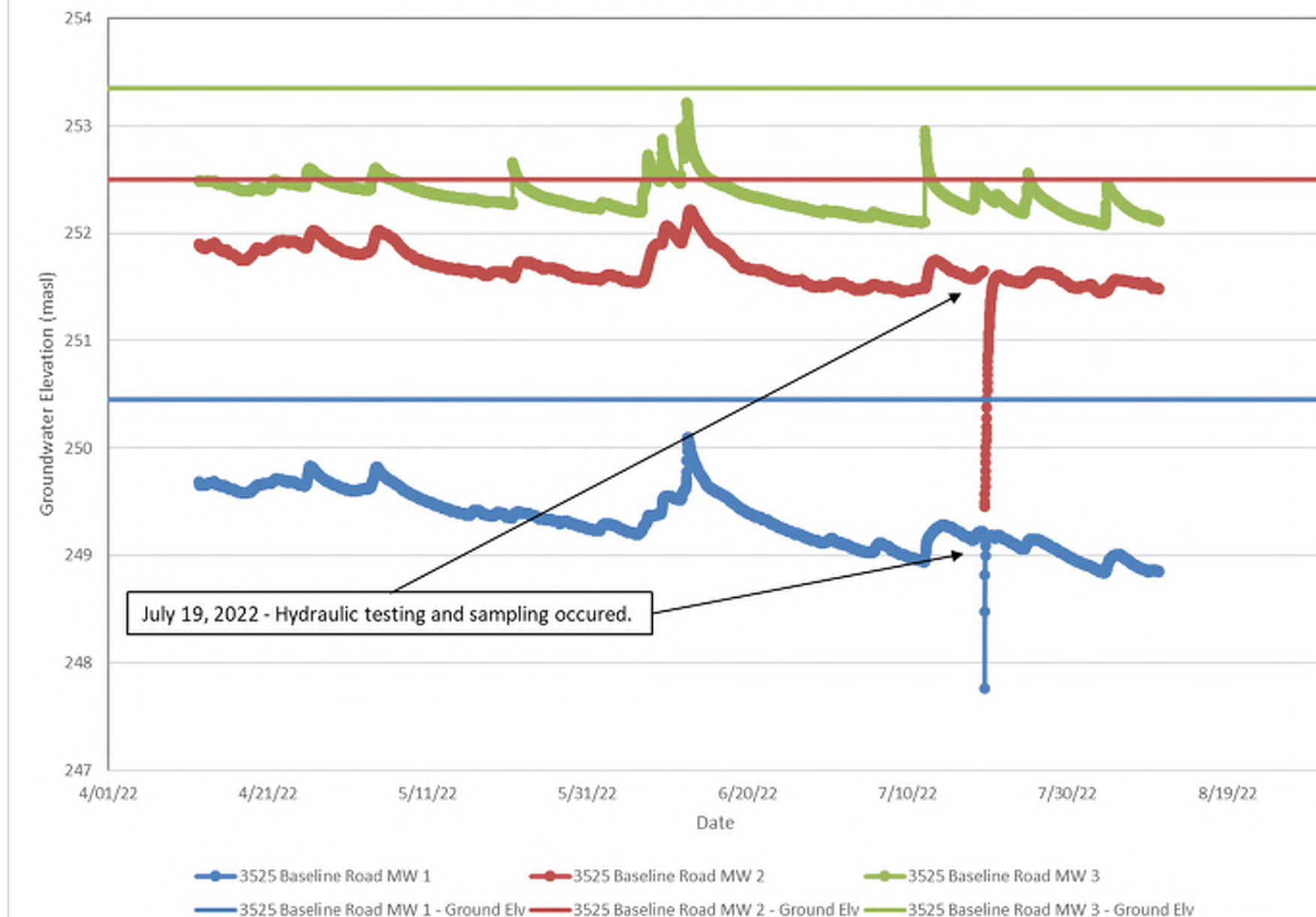
Drawn By: AR

Hydrogeological Assessment
3525 Baseline Road

Town of Georgina, Regional Municipality of York
NORTH GWILLIMBURY CON 5 LOT 23

Figure 6: Monitoring Locations

Figure 7: 3525 Baseline Road Monitoring Well Data



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3525 Baseline Road

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Figure 7: Hydrographs



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3525 Baseline Road

Town of Georgina, Regional Municipality of York
NORTH GWILLIMBURY CON 5 LOT 23

Figure 8: Discharge Plan and Location

Appendix A Borehole and Water Well Records



LEGEND



BH Locations



Test Pit Locations



File No.: 10868-S0221-GEO

Report Number: 2021-15922

Date: November, 2021

BH Location Plan

Proposed SWM Pond

3525 Baseline Road, Sutton, Ontario

Chisholm, Fleming and Associates

The figure provided is for the intended purpose of presenting the approximate borehole locations. This figure should not be used for any other purposes including construction, architecture or for accuracy of dimensions and orientation of objects.

Enclosure No.:

1

Not to Scale

RECORD OF BOREHOLE No. BH1

1 OF 1

METRIC

PROJECT NUMBER 10868 LOCATION 3525 Baseline Road, Sutton, Ontario ORIGINATED BY JS
 DIST HWY BOREHOLE TYPE Solid Stem Augers COMPILED BY CC
 DATUM DATE 2021.08.12 - 2021.08.12 LATITUDE LONGITUDE CHECKED BY JS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED	+ FIELD VANE								
								● QUICK TRIAXIAL	× LAB VANE								
250.5	Topsoil						20	40	60	80	100						
250.0	TOPSOIL - 100 mm thick		1	SS	7												
249.7	FILL - sandy silt, trace clay, trace gravel, trace rootlets, brown, moist																
249.7	FILL - clayey silt, trace gravel, trace rootlets, trace organic, dark brown, moist		2	SS	10												
248.9	PROBABLE FILL - clayey silt, trace gravel, pockets of sand, brown, very moist		3	SS	9												
248.2	CLAYEY SILT TILL - trace gravel, brown, very stiff, very moist		4	SS	17												
246.6	SANDY SILT TILL - trace gravel, brown, dense, moist		5	SS	19												
246.2			6	SS	32												
246.2	End of Borehole at Targeted Depth; Borehole was Open and Water was at 3.7 m Below Existing Ground Surface upon Completion of Drilling.																

RECORD OF BOREHOLE No. BH2

1 OF 1

METRIC

PROJECT NUMBER 10868 LOCATION 3525 Baseline Road, Sutton, Ontario ORIGINATED BY JS
DIST HWY BOREHOLE TYPE Solid Stem Augers COMPILED BY CC
DATUM DATE 2021.08.12 - 2021.08.12 LATITUDE LONGITUDE CHECKED BY JS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
252.5	Topsoil							20	40	60	80	100					
252.4	TOPSOIL - 150 mm thick																
0.2	FILL - silty sand, trace gravel, brown, moist		1	SS	7		252							○			
251.7	PROBABLE FILL - clayey silt, trace gravel, brown, moist		2	SS	18									○			
251.0	CLAYEY SILT - trace gravel, trace sand, brown, very stiff, moist		3	SS	23		251							○			
250.2	CLAYEY SILT TILL - trace gravel, grey, hard, moist		4	SS	46		250							○			
248.7	SANDY SILT TILL - trace gravel, trace clay, containing stone fragments, grey, very dense, moist		5	SS	39		249							○			
248.2	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling.		6	SS	58									○			
4.3																	

RECORD OF BOREHOLE No. BH3

1 OF 1

METRIC

PROJECT NUMBER 10868 LOCATION 3525 Baseline Road, Sutton, Ontario ORIGINATED BY JS
 DIST HWY BOREHOLE TYPE Solid Stem Augers COMPILED BY CC
 DATUM DATE 2021.08.12 - 2021.08.12 LATITUDE LONGITUDE CHECKED BY JS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)
253.4	Topsoil							20	40	60	80	100					
253.2	TOPSOIL - 150 mm thick																
0.2	FILL - sandy silt, trace gravel, trace rootlets, trace organic, containing brick fragments, brown, moist		1	SS	5		253										
252.3			2	SS	8												
1.1	CLAYEY SILT - trace gravel, trace sand, brown, firm to very stiff, moist						252										
			3	SS	19												
251.1							251										
2.3	SANDY SILT TILL - trace gravel, trace clay, brown, dense to very dense, moist		4	SS	50												
			5	SS	54		250										
249.5																	
3.8	SILT - trace clay, grey, very dense, moist		6	SS	74												
249.1																	
4.3	End of Borehole at Targeted Depth; Borehole Caved at 3.9 m and Water was at 3.7 m Below Existing Ground Surface upon Completion of Drilling.																

PROJECT NUMBER _10868

LOCATION _145 Plains Road East, Burlington, Ontario

PROJECT NAME _Proposed SWMP

CLIENT _Chisholm, Fleming and Associates

LITHOLOGIC SYMBOLS (Unified Soil Classification System)



CL-SL: clayey silt



CL-SL-TL: clayey silt till



FILL: TTC Fill (made ground)



SL: silt



SN-SL-TL: sandy silt till



TOPSOIL: Topsoil/peat/organics

SAMPLER SYMBOLS



Split Spoon Sample

WELL CONSTRUCTION SYMBOLS



Bentonite Seal: 1 pipe group, 1 pipe



Concrete: 1 pipe group, 1 pipe



Filter Pack: 1 pipe group, 1 pipe



Slotted Pipe: 1 pipe group, 1 pipe



Slough at bottom of hole

Notes:

Terms describing RELATIVE DENSITY, based on Standard Penetration Test "N"-Value for COURSE GRAINED soils (major portion retained on No. 200 sieve):

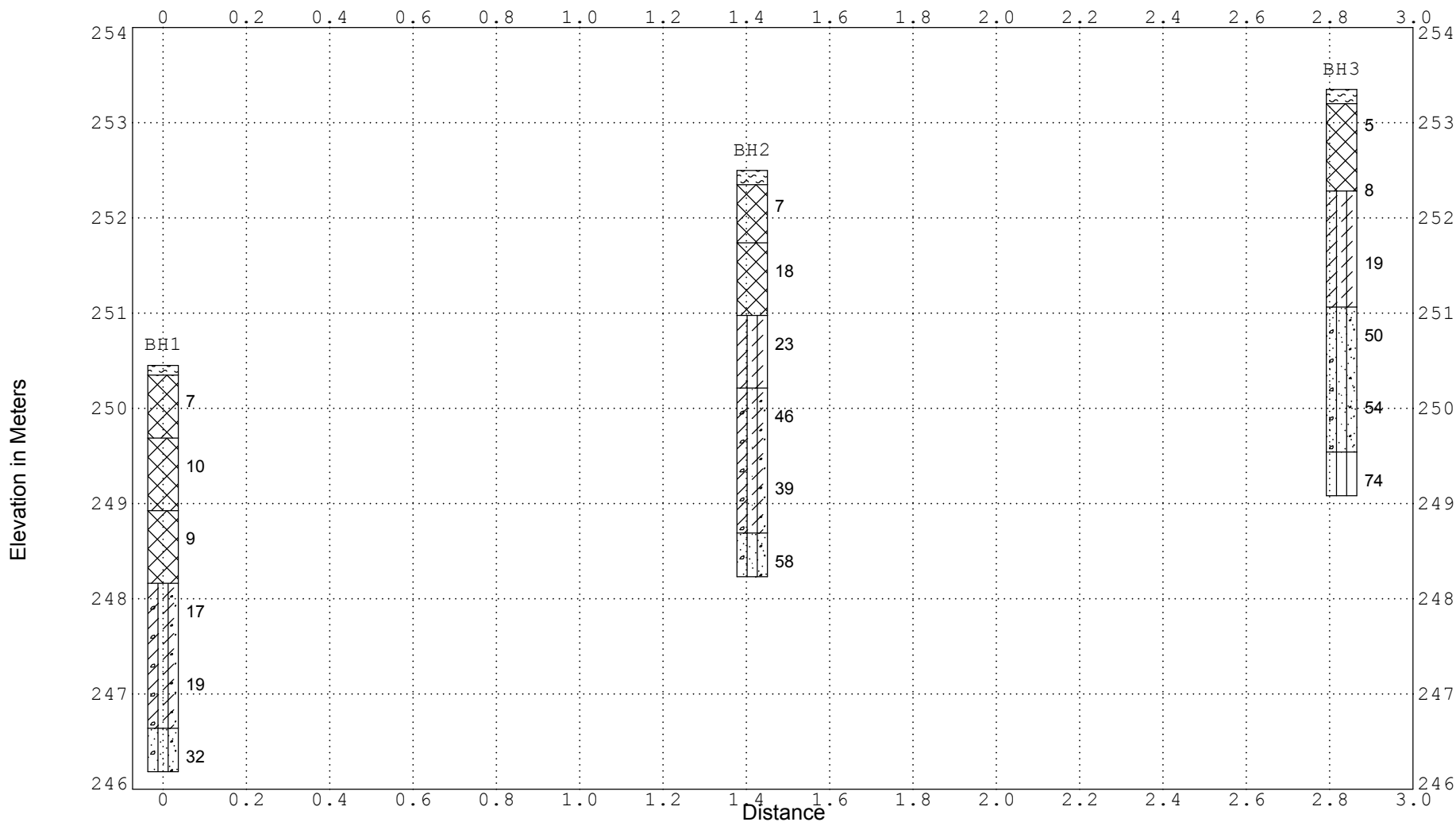
DESCRIPTIVE TERM ["N"-Value (blows/0.3m), Relative Density (%)]

- Very Loose [less than 4, less than 15]
- Loose [4 to 10, 15 to 35]
- Compact or Medium [10 to 30, 35 to 65]
- Dense [30 to 50, 65 to 85]
- Very Dense [greater than 50, greater than 85]

Terms describing CONSISTENCY, based on Standard Penetration Test "N"-Value for FINE GRAINED soils (major portion passing No. 200 sieve):

DESCRIPTIVE TERM [Unconfined Compressive Strength (kPa), "N"-Value (blows/0.3m)]

- Very Soft [less than 25, less than 2]
- Soft [25 to 50, 2 to 4]
- Firm [50 to 100, 4 to 8]
- Stiff [100 to 200, 8 to 15]
- Very Stiff [200 to 400, 15 to 30]
- Hard [greater than 400, greater than 30]



Plan View



SOLA ENGINEERING INC. CONCEPTUAL SOIL PROFILE

Horizontal Scale:

Drawn By:

Vertical Scale:

Approved By:

Proposed SWMP
145 Plains Road East, Burlington, Ontario

Project Number: 10868

Enclosure No.: 6



WATER WELL RECORD

31 D/west

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

11

6913322

69004

CAN

09

COUNTY OR DISTRICT KNOX	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE NORTH GUILMBURY	CON. BLOCK, TRACT, SURVEY ETC 9 81	DATE COMPLETED 05 13 76
P3 SUTTON WEST ONT.		105200 S	0825 S 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
BLACK	LOAM		SOFT	0	1
BROWN	SAND	CLAY	DENSE	1	3
BROWN	CLAY		DENSE	3	16
GREY	CLAY	PEBBLES	HARD	16	62
BLUE	CLAY		DENSE	62	86
BROWN	SAND	GRAVEL	POROUS	86	89
BROWN	CLAY	STONE	CEMENTED	89	90

31	000180285	00036280566	001660566	00622051273	008630566	00896281180	1
32	00906051260						

41 WATER RECORD	51 CASING & OPEN HOLE RECORD	61 PLUGGING & SEALING RECORD
<p>WATER FOUND AT FEET</p> <p>KIND OF WATER</p> <p>1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p> <p>15-18 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p> <p>20-23 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p> <p>25-26 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p> <p>30-33 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p>	<p>WATER RECORD</p> <p>WATER FOUND AT FEET</p> <p>KIND OF WATER</p> <p>1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p> <p>15-18 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p> <p>20-23 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p> <p>25-26 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p> <p>30-33 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p>	<p>WATER RECORD</p> <p>WATER FOUND AT FEET</p> <p>KIND OF WATER</p> <p>1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p> <p>15-18 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p> <p>20-23 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p> <p>25-26 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p> <p>30-33 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL</p>

71 PUMPING TEST	81 LOCATION OF WELL
<p>PUMPING TEST METHOD</p> <p>1 <input checked="" type="checkbox"/> PUMP 2 <input type="checkbox"/> BAILEY</p> <p>WATER LEVEL END OF PUMPING</p> <p>WATER LEVELS DURING</p> <p>15 MINUTES 30 MINUTES 45 MINUTES 60 MINUTES</p> <p>0/0 021 0/8 021 021</p> <p>IF FLOWING GIVE RATE</p> <p>RECOMMENDED PUMP TYPE</p> <p>1 <input type="checkbox"/> SHALLOW 2 <input checked="" type="checkbox"/> DEEP</p> <p>RECOMMENDED PUMP SETTING</p> <p>040</p> <p>RECOMMENDED PUMP RATE</p> <p>0004</p>	<p>IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE INDICATE NORTH BY ARROW.</p> <p>BARN</p> <p>HOUSE</p> <p>APPROX 1/2 MILE</p> <p>DON MILLS RD.</p>

91 FINAL STATUS OF WELL	101 WATER USE	111 METHOD OF DRILLING
<p>1 <input checked="" type="checkbox"/> WATER SUPPLY 2 <input type="checkbox"/> OBSERVATION WELL 3 <input type="checkbox"/> TEST HOLE 4 <input type="checkbox"/> RECHARGE WELL</p> <p>5 <input type="checkbox"/> ABANDONED, INSUFFICIENT SUPPLY 6 <input type="checkbox"/> ABANDONED, POOR QUALITY 7 <input type="checkbox"/> UNFINISHED</p>	<p>1 <input checked="" type="checkbox"/> DOMESTIC 2 <input type="checkbox"/> STOCK 3 <input type="checkbox"/> IRRIGATION 4 <input type="checkbox"/> INDUSTRIAL 5 <input type="checkbox"/> OTHER</p> <p>6 <input type="checkbox"/> COMMERCIAL 7 <input type="checkbox"/> MUNICIPAL 8 <input type="checkbox"/> PUBLIC SUPPLY 9 <input type="checkbox"/> COOLING OR AIR CONDITIONING 10 <input type="checkbox"/> NOT USED</p>	<p>1 <input type="checkbox"/> CABLE TOOL 2 <input checked="" type="checkbox"/> ROTARY (CONVENTIONAL) 3 <input type="checkbox"/> ROTARY (REVERSE) 4 <input type="checkbox"/> ROTARY (AIR) 5 <input type="checkbox"/> AIR PERCUSSION</p> <p>6 <input type="checkbox"/> BORING 7 <input type="checkbox"/> DIAMOND 8 <input type="checkbox"/> JETTING 9 <input type="checkbox"/> DRIVING</p>

CONTRACTOR	OFFICE USE ONLY
<p>NAME OF WELL CONTRACTOR</p> <p>ROGER BOADWAY ENT LTD</p> <p>ADDRESS</p> <p>Box 397 Sutton West Ont L0E1P0</p> <p>NAME OF DRILLER OR BORER</p> <p>ROGER BOADWAY</p> <p>SIGNATURE OF CONTRACTOR</p> <p>Roger Boadway</p> <p>SUBMISSION DATE</p> <p>DAY 13 MO MAY YR 76</p>	<p>DATA SOURCE</p> <p>1</p> <p>DATE OF INSPECTION</p> <p>1413</p> <p>INSPECTOR</p> <p>070676</p> <p>REMARKS</p> <p>p June 27/76</p> <p>WI</p>



Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

6924628

Municipality Con.

69004 CON 05

10 15 20 25 30

County or District YORK	Township/Borough/City/Town/Village GEORGINA	Con block tract survey, etc. 5	Lot 22
Owner's surname YORK REGIONAL POLICE	First name Baseline Rd. Sutton West, ON	Date completed 24 day 09 month 98 year	

[illegible]

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)					
General colour	Most common material	Other materials	General description	Depth – feet	
				From	To
Brown	Soil		Soft	0	1
Brown	Clay	Stones	Soft	1	18
Grey	Clay	Sand, Gravel	Layered	18	76
Grey	Clay		Dense	76	228
Grey	Shale		Soft	228	256
Grey	Limestone		Bedrock	256	261

[illegible]

WATER RECORD									
Water found at - feet		Kind of water							
10-13		1 <input checked="" type="checkbox"/> Fresh	3 <input type="checkbox"/> Sulphur						
		2 <input type="checkbox"/> Salty	4 <input type="checkbox"/> Minerals						
			5 <input type="checkbox"/> Gas						
15-18		1 <input checked="" type="checkbox"/> Fresh	3 <input type="checkbox"/> Sulphur						
		2 <input type="checkbox"/> Salty	4 <input type="checkbox"/> Minerals						
			5 <input type="checkbox"/> Gas						
20-23		1 <input type="checkbox"/> Fresh	3 <input type="checkbox"/> Sulphur						
		2 <input type="checkbox"/> Salty	4 <input type="checkbox"/> Minerals						
			5 <input type="checkbox"/> Gas						
25-28		1 <input type="checkbox"/> Fresh	3 <input type="checkbox"/> Sulphur						
		2 <input type="checkbox"/> Salty	4 <input type="checkbox"/> Minerals						
			5 <input type="checkbox"/> Gas						
30-33		1 <input type="checkbox"/> Fresh	3 <input type="checkbox"/> Sulphur						
		2 <input type="checkbox"/> Salty	4 <input type="checkbox"/> Minerals						
			5 <input type="checkbox"/> Gas						

CASING & OPEN HOLE RECORD				
Inside diam inches	Material	Wall thickness inches	Depth - feet	
			From	To
10-11	1 <input checked="" type="checkbox"/> Steel 2 <input type="checkbox"/> Galvanized 3 <input type="checkbox"/> Concrete 4 <input type="checkbox"/> Open hole 5 <input type="checkbox"/> Plastic			
6 1/2		188	+3	233
17-18	1 <input type="checkbox"/> Steel 2 <input type="checkbox"/> Galvanized 3 <input checked="" type="checkbox"/> Concrete 4 <input type="checkbox"/> Open hole 5 <input type="checkbox"/> Plastic			
6-1 1/8		233		261
24-25	1 <input type="checkbox"/> Steel 2 <input type="checkbox"/> Galvanized 3 <input type="checkbox"/> Concrete 4 <input type="checkbox"/> Open hole 5 <input type="checkbox"/> Plastic			
				27-30

PLUGGING & SEALING RECORD			
Screen		Plugging	
Sizes of opening (Slot No.) Material and type		Sizes of opening (Slot No.)	Length
		Diameter inches	feet
		Depth at top of screen	
		feet	

PLUGGING & SEALING RECORD			
<input checked="" type="checkbox"/> Annular space <input type="checkbox"/> Abandonment			
Depth set at - feet		Material and type (Cement grout, bentonite, etc.)	
From	To		
10-13	14-17		
18-21	22-25		
26-29	30-33		
0	10	Benseal	

PUMPING TEST	Pumping test method 1 <input type="checkbox"/> Pump 2 <input checked="" type="checkbox"/> AIR		Pumping rate 11-14 10 GPM		Duration of pumping 15-18 1 Hours 0 Mins	
	Static level 19-21	Water level end of pumping 22-24	25 Water levels during 1 <input checked="" type="checkbox"/> Pumping 2 <input type="checkbox"/> Recovery			
	75 feet	226 feet	15 minutes 26-28 feet	30 minutes 29-31 feet	45 minutes 32-34 feet	60 minutes 35-37 226 feet
	If flowing give rate 38-41 GPM		Pump intake set at 220 feet		Water at end of test 42 <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Cloudy	
	Recommended pump type 43-45 <input type="checkbox"/> Shallow <input checked="" type="checkbox"/> Deep		Recommended pump setting 220 feet		Recommended pump rate 46-49 10 GPM	

LOCATION OF WELL

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

Baseline Rd.

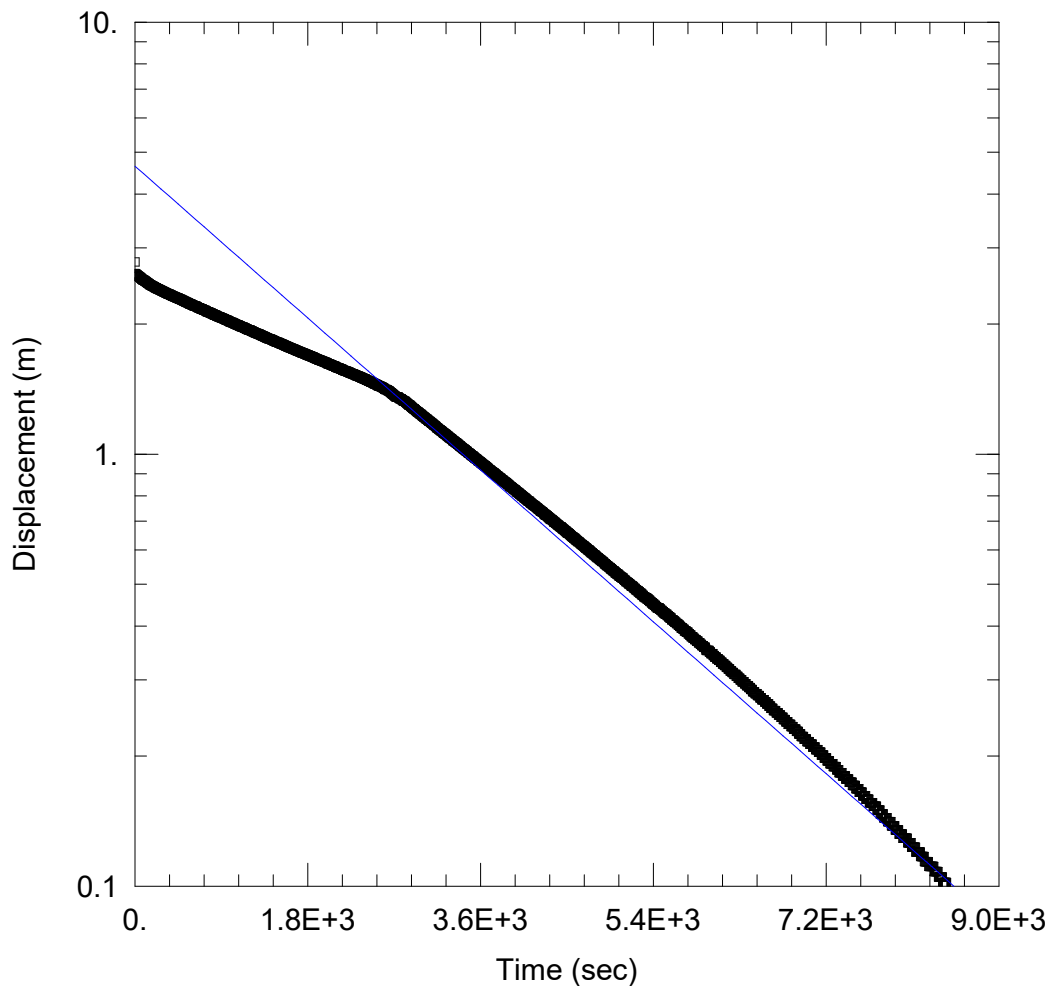
150' ← Well

← 70' Lot line

FINAL STATUS OF WELL		
1 <input checked="" type="checkbox"/> Water supply 2 <input type="checkbox"/> Observation well 3 <input type="checkbox"/> Test hole 4 <input type="checkbox"/> Recharge well	5 <input type="checkbox"/> Abandoned, insufficient supply 6 <input type="checkbox"/> Abandoned, poor quality 7 <input type="checkbox"/> Abandoned (Other) 8 <input type="checkbox"/> Dewatering	9 <input type="checkbox"/> Unfinished 10 <input type="checkbox"/> Replacement well
WATER USE		
1 <input type="checkbox"/> Domestic 2 <input type="checkbox"/> Stock 3 <input type="checkbox"/> Irrigation 4 <input type="checkbox"/> Industrial	5 <input checked="" type="checkbox"/> Commercial 6 <input type="checkbox"/> Municipal 7 <input type="checkbox"/> Public supply 8 <input type="checkbox"/> Cooling & air conditioning	9 <input type="checkbox"/> Not used 10 <input checked="" type="checkbox"/> Other Police Station
METHOD OF CONSTRUCTION		
1 <input type="checkbox"/> Cable tool 2 <input checked="" type="checkbox"/> Rotary (conventional) 3 <input type="checkbox"/> Rotary (reverse) 4 <input type="checkbox"/> Rotary (air)	5 <input type="checkbox"/> Air percussion 6 <input type="checkbox"/> Boring 7 <input type="checkbox"/> Diamond 8 <input type="checkbox"/> Jetting	9 <input type="checkbox"/> Driving 10 <input type="checkbox"/> Digging 11 <input type="checkbox"/> Other

Name of Well Contractor	Well Contractor's Licence No.	<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); border: 1px solid black; padding: 2px;">MINISTRY USE ONLY</div> <div style="margin-left: 10px;"> <div style="display: flex; justify-content: space-between;"> <div> Data source Date of inspection Remarks </div> <div> <div style="border: 1px solid black; padding: 5px; font-size: 2em; font-weight: bold;">1413</div> <div style="display: flex; justify-content: space-between;"> <div> 58 Contractor 59-62 Date received 63-68 </div> <div> OCT 26 1998 </div> </div> </div> </div> </div></div>
Roger Roadway Ent., Ltd.	1413	
Address		
Box 397 Sutton West, ON L0E 1R0		
Name of Well Technician	Well Technician's Licence No.	
Phil Brown	T0035	
Signature of Technician/Contractor	Submission date	
<i>Phil Brown</i>	24 09 98	

Appendix B Hydraulic Testing Graphs



NORTH PATROL YARD

Data Set: C:\Harden 2\Slug Test Results\northpatrolyard_BH1.aqt

Date: 07/27/22

Time: 12:47:50

PROJECT INFORMATION

Company: Harden Environmental

Client: York Region

Project: 2220

Location: 3525 Baseline Road

Test Well: BH1

Test Date: 07/19/22

AQUIFER DATA

Saturated Thickness: 10. m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (BH1)

Initial Displacement: 2.787 m

Static Water Column Height: 3.24 m

Total Well Penetration Depth: 4.3 m

Screen Length: 1.52 m

Casing Radius: 0.0254 m

Well Radius: 0.0635 m

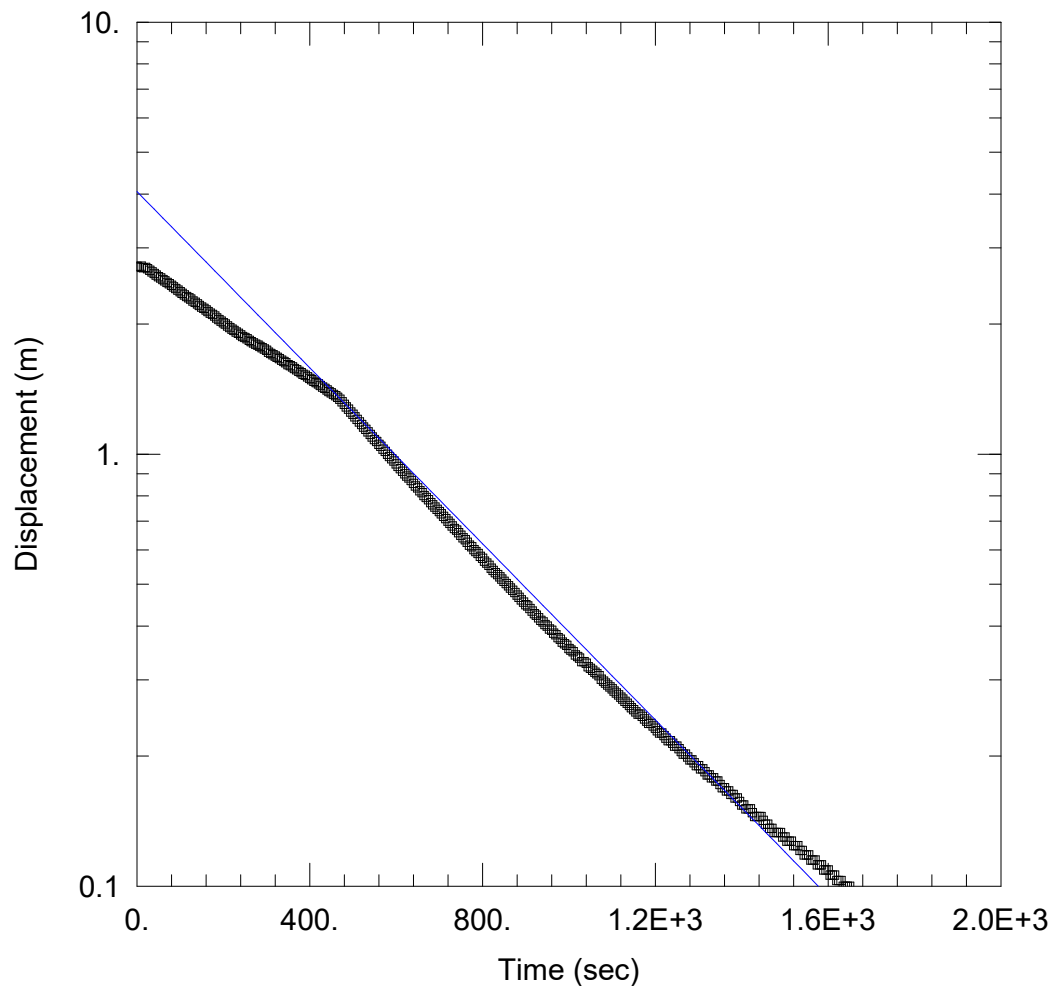
SOLUTION

Aquifer Model: Unconfined

Solution Method: Hvorslev

$K = 4.131E-7$ m/sec

$y_0 = 4.642$ m



NORTH PATROL YARD

Data Set: C:\Harden 2\Slug Test Results\northpatrolyard_BH3.aqt

Date: 07/27/22

Time: 12:48:46

PROJECT INFORMATION

Company: Harden Environmental

Client: York Region

Project: 2220

Location: 3525 Baseline Road

Test Well: BH3

Test Date: 07/19/22

AQUIFER DATA

Saturated Thickness: 10. m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (BH3)

Initial Displacement: 2.719 m

Static Water Column Height: 3.375 m

Total Well Penetration Depth: 4.3 m

Screen Length: 1.52 m

Casing Radius: 0.0254 m

Well Radius: 0.0635 m

SOLUTION

Aquifer Model: Unconfined

Solution Method: Hvorslev

$K = 2.155E-6$ m/sec

$y_0 = 4.051$ m

Appendix C Water Quality

CLIENT NAME: HARDEN ENVIRONMENTAL SERVICES LTD.
4622 NASSAGAWWEYA PUSLINCH TOWNLINE
MOFFAT, ON L0P 1J0
519-826-0099

ATTENTION TO: Allan Rodie

PROJECT: 2220-North Patrol Yard

AGAT WORK ORDER: 22T922462

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician

DATE REPORTED: Jul 28, 2022

PAGES (INCLUDING COVER): 11

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.



Certificate of Analysis

AGAT WORK ORDER: 22T922462

PROJECT: 2220-North Patrol Yard

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

CLIENT NAME: HARDEN ENVIRONMENTAL SERVICES LTD.

ATTENTION TO: Allan Rodie

SAMPLING SITE:

SAMPLED BY:AR

York Region Sanitary - Organics

DATE RECEIVED: 2022-07-19

DATE REPORTED: 2022-07-28

		SAMPLE DESCRIPTION:		POND		BH1	
		SAMPLE TYPE:		Water		Water	
		DATE SAMPLED:		2022-07-19		2022-07-19	
						14:40	
Parameter	Unit	G / S	RDL	4110316	RDL	4110317	
Oil and Grease (animal/vegetable) in water	mg/L		0.5	0.90	0.5	<0.5	
Oil and Grease (mineral) in water	mg/L		0.5	<0.5	0.5	<0.5	
Methylene Chloride	µg/L	5.2	0.6	<0.6	0.3	<0.3	
trans-1,3-Dichloropropene	µg/L	5.6	0.60	<0.60	0.30	<0.30	
Methyl Ethyl Ketone	µg/L		1.8	<1.8	0.9	<0.9	
cis- 1,2-Dichloroethylene	µg/L	5.6	0.4	<0.4	0.2	<0.2	
Chloroform	µg/L	2.0	0.4	<0.4	0.2	<0.2	
Benzene	µg/L	2.0	0.4	<0.4	0.2	<0.2	
Trichloroethylene	µg/L	8.0	0.4	<0.4	0.2	<0.2	
Toluene	µg/L	2.0	0.4	<0.4	0.2	<0.2	
Tetrachloroethene	µg/L	4.4	0.2	<0.2	0.1	<0.1	
Ethylbenzene	µg/L	2.0	0.2	<0.2	0.1	<0.1	
1,1,2,2-Tetrachloroethane	µg/L	17.0	0.2	<0.2	0.1	<0.1	
Styrene	µg/L		0.2	<0.2	0.1	<0.1	
1,2-Dichlorobenzene	µg/L	5.6	0.2	<0.2	0.1	<0.1	
1,4-Dichlorobenzene	µg/L	6.8	0.2	<0.2	0.1	<0.1	
m & p-Xylene	µg/L		0.4	<0.4	0.2	<0.2	
o-Xylene	µg/L		0.2	<0.2	0.1	<0.1	
Xylenes (Total)	µg/L	4.4	0.2	<0.2	0.2	<0.2	
PCBs	µg/L	0.4	0.2	<0.2	0.2	<0.2	
Di-n-butyl phthalate	µg/L	15.0	0.5	<0.5	0.5	<0.5	
Bis(2-Ethylhexyl)phthalate	µg/L	8.8	0.5	<0.5	0.5	<0.5	

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 22T922462

PROJECT: 2220-North Patrol Yard

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

CLIENT NAME: HARDEN ENVIRONMENTAL SERVICES LTD.

ATTENTION TO: Allan Rodie

SAMPLING SITE:

SAMPLED BY:AR

York Region Sanitary - Organics

DATE RECEIVED: 2022-07-19

DATE REPORTED: 2022-07-28

		SAMPLE DESCRIPTION:		POND		BH1	
		SAMPLE TYPE:		Water		Water	
		DATE SAMPLED:		2022-07-19		2022-07-19	
						14:40	
Surrogate	Unit	Acceptable Limits	4110316			4110317	
Toluene-d8	% Recovery	50-140	106	1		102	
4-Bromofluorobenzene	% Recovery	50-140	102	1		100	
Decachlorobiphenyl	%	50-140	107	1		90	
2,4,6-Tribromophenol	%	50-140	97	1		96	
2-Fluorophenol	%	50-140	77	1		88	
Chrysene-d12	%	50-140	87	1		90	
phenol-d6 surrogate	%	50-140	62	1		88	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to The Regional Municipality of York - Limits for Storm Sewer Discharge [BY-LAW NO.2011-56]
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.

4110316 Dilution factor=2
The sample was diluted because it was foamy. The reporting detection limit has been corrected for the dilution factor used.
Oil and Grease animal/vegetable is a calculated parameter. The calculated value is the difference between Total O&G and Mineral O&G.

4110317 Oil and Grease animal/vegetable is a calculated parameter. The calculated value is the difference between Total O&G and Mineral O&G.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 22T922462

PROJECT: 2220-North Patrol Yard

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

CLIENT NAME: HARDEN ENVIRONMENTAL SERVICES LTD.

ATTENTION TO: Allan Rodie

SAMPLING SITE:

SAMPLED BY:AR

CBOD5

DATE RECEIVED: 2022-07-19

DATE REPORTED: 2022-07-28

		SAMPLE DESCRIPTION:		POND	BH1	
		SAMPLE TYPE:		Water	Water	
		DATE SAMPLED:		2022-07-19	2022-07-19 14:40	
Parameter	Unit	G / S	RDL	4110316	RDL	4110317
Biochemical Oxygen Demand, Carbonaceous	mg/L	15	2	6	6	<6

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to The Regional Municipality of York - Limits for Storm Sewer Discharge [BY-LAW NO.2011-56]
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.

4110317 RDL for BOD is raised due to insufficient DO depletion at selected dilution levels.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By:





Certificate of Analysis

AGAT WORK ORDER: 22T922462

PROJECT: 2220-North Patrol Yard

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

CLIENT NAME: HARDEN ENVIRONMENTAL SERVICES LTD.

ATTENTION TO: Allan Rodie

SAMPLING SITE:

SAMPLED BY:AR

York Region Storm Sewer Use By-Law - Inorganics

DATE RECEIVED: 2022-07-19

DATE REPORTED: 2022-07-28

		SAMPLE DESCRIPTION:		POND	BH1
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2022-07-19	2022-07-19
					14:40
Parameter	Unit	G / S	RDL	4110316	4110317
pH	pH Units	6.0-9.0	NA	7.64	7.43
Total Suspended Solids	mg/L	15	10	13	354
Total Kjeldahl Nitrogen	mg/L	1	0.10	0.75	0.26
Phenols	mg/L	0.008	0.004	0.008	0.009
Cyanide, SAD	mg/L	0.02	0.002	<0.002	0.003
Total Arsenic	mg/L	0.020	0.015	<0.015	<0.015
Total Cadmium	mg/L	0.008	0.005	<0.005	<0.005
Total Chromium	mg/L	0.080	0.020	<0.020	<0.020
Total Copper	mg/L	0.050	0.015	<0.015	<0.015
Total Lead	mg/L	0.120	0.020	<0.020	<0.020
Total Manganese	mg/L	0.150	0.020	0.064	0.188
Total Mercury	mg/L	0.0004	0.0002	<0.0002	<0.0002
Total Nickel	mg/L	0.080	0.015	<0.015	<0.015
Total Phosphorus	mg/L	0.400	0.02	0.07	0.13
Total Selenium	mg/L	0.020	0.002	<0.002	<0.002
Total Silver	mg/L	0.120	0.020	<0.020	<0.020
Total Zinc	mg/L	0.040	0.020	<0.020	<0.020

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to The Regional Municipality of York - Limits for Storm Sewer Discharge [BY-LAW NO.2011-56]
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.

4110316-4110317 Dilution required, RDL has been increased accordingly.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:





AGAT Laboratories

Exceedance Summary

AGAT WORK ORDER: 22T922462

PROJECT: 2220-North Patrol Yard

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

CLIENT NAME: HARDEN ENVIRONMENTAL SERVICES LTD.

ATTENTION TO: Allan Rodie

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
4110317	BH1	ON York SM	York Region Storm Sewer Use By-Law - Inorganics	Phenols	mg/L	0.008	0.009
4110317	BH1	ON York SM	York Region Storm Sewer Use By-Law - Inorganics	Total Manganese	mg/L	0.150	0.188
4110317	BH1	ON York SM	York Region Storm Sewer Use By-Law - Inorganics	Total Suspended Solids	mg/L	15	354

Quality Assurance

CLIENT NAME: HARDEN ENVIRONMENTAL SERVICES LTD.

AGAT WORK ORDER: 22T922462

PROJECT: 2220-North Patrol Yard

ATTENTION TO: Allan Rodie

SAMPLING SITE:

SAMPLED BY: AR

Trace Organics Analysis

RPT Date: Jul 28, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
York Region Sanitary - Organics															
Oil and Grease (animal/vegetable) in water	4111931		< 0.5	< 0.5	NA	< 0.5	101%	70%	130%	108%	70%	130%	107%	70%	130%
Oil and Grease (mineral) in water	4111931		< 0.5	< 0.5	NA	< 0.5	81%	70%	130%	81%	70%	130%	83%	70%	130%
Methylene Chloride	4110588		<0.3	<0.3	NA	< 0.3	71%	50%	140%	88%	60%	130%	115%	50%	140%
trans-1,3-Dichloropropene	4110588		<0.30	<0.30	NA	< 0.30	79%	50%	140%	119%	60%	130%	92%	50%	140%
Methyl Ethyl Ketone	4110588		<0.9	<0.9	NA	< 0.9	97%	50%	140%	111%	50%	140%	99%	50%	140%
cis- 1,2-Dichloroethylene	4110588		<0.2	<0.2	NA	< 0.2	72%	50%	140%	93%	60%	130%	92%	50%	140%
Chloroform	4110588		<0.2	<0.2	NA	< 0.2	78%	50%	140%	92%	60%	130%	104%	50%	140%
Benzene	4110588		<0.2	<0.2	NA	< 0.2	101%	50%	140%	85%	60%	130%	94%	50%	140%
Trichloroethylene	4110588		<0.2	<0.2	NA	< 0.2	80%	50%	140%	100%	60%	130%	98%	50%	140%
Toluene	4110588		<0.2	<0.2	NA	< 0.2	85%	50%	140%	111%	60%	130%	99%	50%	140%
Tetrachloroethene	4110588		<0.1	<0.1	NA	< 0.1	85%	50%	140%	113%	60%	130%	98%	50%	140%
Ethylbenzene	4110588		<0.1	<0.1	NA	< 0.1	87%	50%	140%	116%	60%	130%	103%	50%	140%
1,1,2,2-Tetrachloroethane	4110588		<0.1	<0.1	NA	< 0.1	118%	50%	140%	118%	60%	130%	101%	50%	140%
Styrene	4110588		<0.1	<0.1	NA	< 0.1	89%	50%	140%	115%	60%	130%	104%	50%	140%
1,2-Dichlorobenzene	4110588		<0.1	<0.1	NA	< 0.1	99%	50%	140%	99%	60%	130%	115%	50%	140%
1,4-Dichlorobenzene	4110588		<0.1	<0.1	NA	< 0.1	95%	50%	140%	92%	60%	130%	113%	50%	140%
m & p-Xylene	4110588		<0.2	<0.2	NA	< 0.2	84%	50%	140%	111%	60%	130%	100%	50%	140%
o-Xylene	4110588		<0.1	<0.1	NA	< 0.1	87%	50%	140%	113%	60%	130%	102%	50%	140%
PCBs	4110275		< 0.1	< 0.1	NA	< 0.2	101%	50%	140%	100%	50%	140%	82%	50%	140%
Di-n-butyl phthalate	4113885		<0.5	<0.5	NA	< 0.5	94%	50%	140%	101%	50%	140%	76%	50%	140%
Bis(2-Ethylhexyl)phthalate	4113885		<0.5	<0.5	NA	< 0.5	114%	50%	140%	100%	50%	140%	106%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:



Quality Assurance

CLIENT NAME: HARDEN ENVIRONMENTAL SERVICES LTD.

AGAT WORK ORDER: 22T922462

PROJECT: 2220-North Patrol Yard

ATTENTION TO: Allan Rodie

SAMPLING SITE:

SAMPLED BY:AR

Water Analysis															
RPT Date: Jul 28, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

York Region Storm Sewer Use By-Law - Inorganics

pH	4110250		7.30	7.52	3.0%	NA	102%	90%	110%						
Total Suspended Solids	4109212		37	37	NA	< 10	96%	80%	120%						
Total Kjeldahl Nitrogen	4100106		0.40	0.41	NA	< 0.10	100%	70%	130%	100%	80%	120%	99%	70%	130%
Phenols	4102637		<0.001	<0.001	NA	< 0.001	106%	90%	110%	103%	90%	110%	91%	80%	120%
Cyanide, SAD	4082679		<0.002	<0.002	NA	< 0.002	96%	70%	130%	86%	80%	120%	101%	70%	130%
Total Arsenic	4110321		<0.015	<0.015	NA	< 0.015	95%	70%	130%	91%	80%	120%	90%	70%	130%
Total Cadmium	4110321		<0.005	<0.005	NA	< 0.005	99%	70%	130%	103%	80%	120%	92%	70%	130%
Total Chromium	4110321		<0.020	<0.020	NA	< 0.020	100%	70%	130%	97%	80%	120%	93%	70%	130%
Total Copper	4110321		<0.015	<0.015	NA	< 0.015	101%	70%	130%	104%	80%	120%	90%	70%	130%
Total Lead	4110321		<0.020	<0.020	NA	< 0.020	99%	70%	130%	92%	80%	120%	89%	70%	130%
Total Manganese	4110321		0.138	0.133	3.7%	< 0.020	104%	70%	130%	100%	80%	120%	97%	70%	130%
Total Mercury	4110316 4110316		<0.0002	<0.0002	NA	< 0.0002	102%	70%	130%	104%	80%	120%	100%	70%	130%
Total Nickel	4110321		<0.015	<0.015	NA	< 0.015	102%	70%	130%	95%	80%	120%	91%	70%	130%
Total Phosphorus	4119536		0.20	0.21	4.9%	< 0.02	99%	70%	130%	98%	80%	120%	NA	70%	130%
Total Selenium	4110321		<0.002	<0.002	NA	< 0.002	107%	70%	130%	93%	80%	120%	92%	70%	130%
Total Silver	4110321		<0.020	<0.020	NA	< 0.020	100%	70%	130%	93%	80%	120%	91%	70%	130%
Total Zinc	4110321		<0.020	<0.020	NA	< 0.020	99%	70%	130%	105%	80%	120%	93%	70%	130%

CBOD5

Biochemical Oxygen Demand, Carbonaceous	4111032		203	198	2.5%	< 2	94%	70%	130%						
---	---------	--	-----	-----	------	-----	-----	-----	------	--	--	--	--	--	--

Comments: NA Signifies Not Applicable.

Duplicate NA: results are less than 5X the RDL and RPD will not be calculated.

Matrix spike: Spike level < native concentration. Matrix spike acceptance limits do not apply.

Certified By:



Method Summary

CLIENT NAME: HARDEN ENVIRONMENTAL SERVICES LTD.

AGAT WORK ORDER: 22T922462

PROJECT: 2220-North Patrol Yard

ATTENTION TO: Allan Rodie

SAMPLING SITE:

SAMPLED BY: AR

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Oil and Grease (animal/vegetable) in water	VOL-91-5011	EPA SW-846 3510C & SM 5520	GRAVIMETRIC
Oil and Grease (mineral) in water	VOL-91-5011	EPA SW-846 3510C & SM 5520	GRAVIMETRIC
Methylene Chloride	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P & T) GC/MS
trans-1,3-Dichloropropene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P & T) GC/MS
Methyl Ethyl Ketone	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
Tetrachloroethene	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
Styrene	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	EPA SW-846 5230B & 8260	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
PCBs	ORG-91-5112	modified from EPA SW-846 3510 & 8082A	GC/ECD
Decachlorobiphenyl	ORG-91-5112	modified from EPA SW846 3510C & 8082A	GC/ECD
Di-n-butyl phthalate	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Bis(2-Ethylhexyl)phthalate	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
2,4,6-Tribromophenol	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
2-Fluorophenol	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Chrysene-d12	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
phenol-d6 surrogate	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS

Method Summary

CLIENT NAME: HARDEN ENVIRONMENTAL SERVICES LTD.

AGAT WORK ORDER: 22T922462

PROJECT: 2220-North Patrol Yard

ATTENTION TO: Allan Rodie

SAMPLING SITE:

SAMPLED BY: AR

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Biochemical Oxygen Demand, Carbonaceous	INOR-121-6023	SM 5210 B	INCUBATOR
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Total Suspended Solids	INOR-93-6028	modified from EPA 1684, ON MOECC E3139, SM 2540C,D	BALANCE
Total Kjeldahl Nitrogen	INOR-93-6048	modified from EPA 351.2 and SM 4500-NORG D	LACHAT FIA
Phenols	INOR-93-6072	modified from SM 5530 D	LACHAT FIA
Cyanide, SAD	INOR-93-6051	modified from MOECC E3015; SM 4500-CN- A, B, & C	TECHNICON AUTO ANALYZER
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
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 Phosphorus	INOR-93-6022	modified from SM 4500-P B and SM 4500-P E	SPECTROPHOTOMETER
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
web@orth.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)

Report Information:

Company: HARDEN ENVIRONMENTAL SERVICES LTD.
Contact: Allan Rodie 519-400-7113
Address: _____
Phone: 519-826-0099 Fax: _____
Reports to be sent to:
1. Email: arodie@hardenenv.com
2. Email: sdenhoed@hardenenv.com

Regulatory Requirements:

(Please check all applicable boxes)

☐ Regulation 153/04

☐ Excess Soils R406

Table Indicate One

☐ Ind/Corn

☐ Res/Park

☐ Agriculture

Table Indicate One

☐ Regulation 558

☐ CCME

Soil Texture (Check One)

☐ Coarse

☐ Fine

☒ Sewer Use
☐ Sanitary ☒ Storm
YORK
Region

☐ Prov. Water Quality Objectives (PWQO)

☐ Other

Indicate One

Project Information:

Project: 2220-NORTH PATROL YARD
Site Location: AR
Sampled By: _____
AGAT Quote #: _____ PO: _____

Please note: If quotation number is not provided, client will be billed full price for analysis.

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

Field Filtered - Metals, Hg, CrVI, DOC

O. Reg 153

Metals & Inorganics

Metals - ☐ CrVI, ☐ Hg, ☐ HWSB

BTEX, FLF4 PHOS

PAHs

PCBs

VOC

Andors

Landfill Disposal Characterization TOLP:

TOLP: ☐ Metals ☐ VOCs ☐ PAHs ☐ PCBs

Excess Soils SPLP Rainwater Leach

SPLP: ☐ Metals ☐ VOCs ☐ SVOCs

Excess Soils Characterization Package

pH, ICPCMS Metals, BTEX, FLF4

Corrosivity: Include Moisture ☐ Sulphide

YORK REGION-STORM

Potentially Hazardous or High Concentration (Y/N)

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y / N	Metals & Inorganics	Metals - <input type="checkbox"/> CrVI, <input type="checkbox"/> Hg, <input type="checkbox"/> HWSB	BTEX, FLF4 PHOS	PAHs	PCBs	VOC	Andors	Landfill Disposal Characterization TOLP:	Excess Soils SPLP Rainwater Leach	Excess Soils Characterization Package	pH, ICPCMS Metals, BTEX, FLF4	Corrosivity: Include Moisture <input type="checkbox"/> Sulphide	<u>YORK REGION-STORM</u>	Potentially Hazardous or High Concentration (Y/N)
<u>POND</u>	<u>7/19/22</u>	<u>1230</u>	<u>AM</u>	<u>SW</u>		<u>NO</u>														
<u>BH1</u>	<u>7/19/22</u>	<u>240</u>	<u>AM</u>	<u>GW</u>		<u>NO</u>														
			AM																	
			PM																	
			AM																	
			PM																	
			AM																	
			PM																	
			AM																	
			PM																	
			AM																	
			PM																	

Samples Relinquished By (Print Name and Sign):

Allan Rodie AR

Date:

7/19/22

Time:

4:18pm

Samples Received By (Print Name and Sign):

Amber D. Amber D.

Date:

Time:

Samples Relinquished By (Print Name and Sign):

Date:

Time:

Samples Received By (Print Name and Sign):

Date:

Time:

No: T-134394

Appendix D Dewatering Calculations

Project: North Maintenance Yard York Region
 Location: **3525 Baseline Road**
 Date: 29-Jul-22
 Project #: 2220

ESTIMATE OF DEWATERING July 2022 water levels

PARAMETERS		Units
Ground Surface Elevation	253	m AMSL
Initial Water Level	252.6	m AMSL
Lowest Water Level during Dewatering	249.4	m AMSL
Aquifer Bottom Elevation	237.6	m AMSL
Initial Head above datum (H)	15	metres
Dewatering head above datum (h)	11.8	metres
<hr/>		
Hydraulic Conductivity (k)	2.20E-06	m/s
	0.19008000	m/day
<hr/>		
Length of Site (L)	30	metres
Width of Site (W)	18	metres
Equivelent Radius r_e (Equation 1)	13	metres
Estimated Radius of Influence from Excavation (R_x) (Equation 2)	14	metres
Radius of Influence (R)	27	metres
<hr/>		
Safety Factor	3	
<hr/>		
Estimated Rate of Discharge (Equation 3)	209	m ³ /day
	145.1	L/min
	2.42	L/sec
	31.96	Imp. Gall/min

Equation 1 $Re = \sqrt{L \times W / \pi}$

Equation 2 $R_x = 3000 h \sqrt{k}$

Equation 3 $Q = \frac{k(H^2 - h^2)}{.733 \log (R/r_e)}$



Appendix E: Sample Notification Letter



Groundwater Studies
Geochemistry
Phase I / II
Regional Flow Studies
Contaminant Investigations
OMB Hearings
Water Quality Sampling
Monitoring
Groundwater Protection
Studies
Groundwater Modelling
Groundwater Mapping

File: 2220

XXXXXXXXXX

To Whom it May Concern:

Re: Commencement of Water Taking -3525 Baseline Road, Sutton

You are hereby notified that water taking has been approved for construction services at 3525 Baseline Road in Sutton. The owners have been issued an Environmental Activity Sector Registry for water taking; registration number XXXXXXXXX.

Water taking under this EASR is approved from xxxxxx, 2022 to xxxxxx, 2022. Water taking will occur as needed.

Sincerely,

Harden Environmental Services Ltd.

Stan Denhoed, M.Sc., P.Eng.
Senior Hydrogeologist

Appendix F: Sample Discharge Plan

HARDEN ENVIRONMENTAL SERVICES LIMITED

WATER TAKING PLAN AND DISCHARGE PLAN

EASR Registration Number: xxxxxxxx

PREPARED FOR:

York Region

July 2022

REF. No. 2220



Harden Environmental Services Ltd.

Table of Contents

1.0	Water taking plan	1
1.1	Identification of the expected area of influence	1
1.2	Potential impact of the soil settlement	1
1.3	Identification of measures to address the potential impact of the soil settlement	1
1.4	Potential impact of water taking on other water users in the area of influence	1
1.5	Mitigation Measures	2
1.6	Water Monitoring Program	2
1.7	Summary of Qualifications	2
1.8	Date of Plan Preparation	2
2.0	Discharge plan:	2
2.1	Discharge Locations	2
2.2	Method of Water Transfer	2
2.3	Erosion and Sedimentation Measures	3
2.4	Water Quality and Turbidity Issues	3
2.5	Impact to the Natural Environment	3
2.6	Water Temperature	3
2.7	Summary of Qualifications	3
2.8	Date of Plan Preparation	3
3.0	Notification:	3
4.0	Reporting	4
5.0	Complaints	4

Important Phone Numbers:

Ministry of the Environment Conservation and Parks Barrie District Office 1 800-890-8511

Ministry of the Environment Conservation and Parks 24 Hour Telephone Line

- Telephone: 416-325-3000
- Toll-free: 1-800-268-6060

York Region

Harden Environmental Services Ltd.

Figures

Figure 1: Dewatering Plan and Monitoring Locations

Appendices

Appendix A Dewatering Calculations

Appendix B Qualifications

Preamble

York Region has been issued an Environmental Activity Sector Registry for the taking of up to 400,000 liters per day commencing xxxxx for a period of xxx days. The EASR Registration Number is xxxxxxxx. The purpose of the dewatering is to retrofit a storm water pond.

The following water taking plan and discharge plan are requirements of the water taking.

1.0 Water taking plan

Please refer to Figure 1 for the Dewatering Plan.

1.1 Identification of the expected area of influence

Excavations in the shallow silty clay deposit will require dewatering surface water and/or groundwater during the pond retrofit. The maximum depth of excavation is estimated to be three metres below the water table. The high-water table is estimated, in the worst case, to be at an elevation of 252.6 m AMSL and the dewatering will lower the water table to 249.4 m AMSL. The estimated area of influence is approximately 15 metres.

1.2 Potential impact of the soil settlement

The water taking will be very temporary in nature and the soils are of a silty clay texture and not prone to consolidation upon dewatering for relatively short periods of time. No settlement of on-site or off-site buildings is anticipated.

1.3 Identification of measures to address the potential impact of the soil settlement

No measures are required.

1.4 Potential impact of water taking on other water users in the area of influence

There are no other users in the predicted area of influence of the temporary dewatering at the site. The nearest private residence is 220 m from the proposed area to be dewatered.

1.5 Mitigation Measures

There are no other users in the predicted area of influence of the temporary dewatering at the site. No mitigation measures are necessary.

1.6 Water Monitoring Program

Groundwater monitoring well BH3 will be installed on-site in the location shown on Figure 1. A data logger will be installed and maintained on-site for the duration of the dewatering.

1.7 Summary of Qualifications

The qualifications of Stan Denhoed, P.Eng, M.Sc. is included in Appendix B.

1.8 Date of Plan Preparation

This plan was prepared on xxxxx, 2022.

2.0 Discharge plan:

2.1 Discharge Locations

There is one discharge location that will be used. Discharge 1 is located on the west side of the entrance to the Patrol Yard at Baseline Road. The discharge location is a stormwater open ditch. The location is found on Figure 1.

The discharge location is not located within an area that is part of a wellhead protection area and that is identified as "WHPA-A" in a source protection plan approved by the Minister under the *Clean Water Act, 2006*

Location	Northing (UTM)	Easting(UTM)
Discharge 1	4905389	626099

2.2 Method of Water Transfer

The proposed transfer method is by mechanical pumping from McMinnows Pond to Baseline Pond and gravity from Baseline Pond to the roadside ditch. In the event of a one-hundred-year storm, groundwater and surface water will be discharged to the same locations at a rate not exceeding 400,000 liters per day.

2.3 Erosion and Sedimentation Measures

At Discharge 1, the discharge water will be pumped directly 3.5 x 5 m geotextile filter bag. The filter bag and discharge location will be inspected daily.

2.4 Water Quality and Turbidity Issues

There are no surface water bodies within 30 metres of discharge locations. Discharge occurs into a grass lined ditch. Nonetheless, should this occur, total suspended solid sampling is being conducted weekly.

The discharge water will inspected to not have a visible petroleum hydrocarbon sheen.

2.5 Impact to the Natural Environment

It is our opinion that there will be no negative impact on the natural environment from either a water quality impact or water quantity impact.

2.6 Water Temperature

Harden Environmental considered the temperature of the discharge water into location Discharge 1. The ditch is seasonally dry and does not contain any aquatic species sensitive to water temperature.

2.7 Summary of Qualifications

The qualifications of Stan Denhoed, P.Eng, M.Sc. are included in Appendix B.

2.8 Date of Plan Preparation

This plan was prepared on xxxxx, 2022.

3.0 Notification:

Written notice about the taking(s) has been given to the Town of Georgina, and the Lake Simcoe Region Conservation Authority This notification included the following information;

Person proposing to take and discharge the water	York Region
Dates on which the water will be taken	xxxx 2022 to xxxx 2022
Location of the discharge	See attached map

Harden Environmental Services Ltd.

Specifically, the notification was provided to the following persons:

XXXXXXX

XXXXXX

4.0 Reporting

The volume of water taken daily will be reported to the Ministry on or before March 31 in each year, for each location from which water was taken in the previous calendar year. If no water is taken, then a “no taking” report will be entered.

The water takings will be reported online through the Regulatory Self-Reporting System (RSRS) which is accessed through the online account.

5.0 Complaints

If a complaint is received with respect to the taking of water and the complaint relates to the natural environment, the ministry shall be notified of the complaint immediately after the complaint is received.

Notification shall be to the Barrie District Office (800) 890-8511 of the ministry during normal business hours and after hours to the ministry’s Spills Action Centre by calling:

- Telephone: 416-325-3000
- Toll-free: 1-800-268-6060

A record of the complaint will be made and have the following minimal information:

- the date and time the complaint was received
- a copy of the complaint, if it is a written complaint
- a summary of the complaint, if it is not a written complaint
- a summary of measures taken, if any, to address the complaint

Harden Environmental Services Ltd.

Sincerely,
Harden Environmental Services Ltd.



Harden
Environmental
Services Ltd.

Project No: 2220

Date: July 2022

Drawn By: AR

Hydrogeological Assessment
3525 Baseline Road

Town of Georgina, Regional Municipality of York
NORTH GWILLIMBURY CON 5 LOT 23

Figure 8: Discharge Plan and Location

Harden Environmental Services Ltd.

Appendix A – Dewatering Calculations

Project: North Maintenance Yard York Region
 Location: **3525 Baseline Road**
 Date: 29-Jul-22
 Project #: 2220

ESTIMATE OF DEWATERING July 2022 water levels

PARAMETERS		Units
Ground Surface Elevation	253	m AMSL
Initial Water Level	252.7	m AMSL
Lowest Water Level during Dewatering	248.9	m AMSL
Aquifer Bottom Elevation	233.9	m AMSL
Initial Head above datum (H)	18.8	metres
Dewatering head above datum (h)	15	metres
<hr/>		
Hydraulic Conductivity (k)	2.20E-06	m/s
	0.19008000	m/day
<hr/>		
Length of Site (L)	30	metres
Width of Site (W)	18	metres
Equivalent Radius r_e (Equation 1)	13	metres
Estimated Radius of Influence from Excavation (R_x) (Equation 2)	17	metres
Radius of Influence (R)	30	metres
<hr/>		
Safety Factor	3	
<hr/>		
Estimated Rate of Discharge (Equation 3)	278	m ³ /day
	192.9	L/min
	3.21	L/sec
	42.49	Imp. Gall/min

Equation 1 $Re = \sqrt{L \times W / \pi}$

Equation 2 $R_x = 3000 h \sqrt{k}$

Equation 3 $Q = \frac{k(H^2 - h^2)}{.733 \log (R/r_e)}$



Harden Environmental Services Ltd.

Appendix B – Qualifications



Stan Denhoed, P.Eng., M.Sc.

Senior Hydrogeologist

Education:

Institute for Hydraulic Engineering, Delft, The Netherlands, 1994
Master of Science in Hydrological Engineering Degree

University of Waterloo, Waterloo, Ontario, 1986
Bachelor of Applied Science Degree, Geological Engineering

Professional Experience

Aggregate Licensing, Letters of Opinion and Level I/II Hydrogeological Reports

Environmental investigations to ascertain potential impacts from dewatering or extractive activities in bedrock and sand and gravel. Compliance monitoring of active quarries and pits. Development of detailed water balances for extractive operation. Groundwater flow studies related to extraction and dewatering. I have worked in the following geological environments in regards to pits and quarries; Aberfoyle Outwash Deposit, Paris Moraine, Galt Moraine, Oro Hills, Caledon Outwash, Amabel Formation, Guelph Formation, Eramosa Formation, Gull River Formation, Bobcaygeon Formation, Verulum Formation, Oak Ridges Moraine, Precambrian Shield, Bois Blanc Formation, Simcoe Uplands.

Surface Water / Groundwater Interactions

Evaluation of changing groundwater levels on wetlands and fisheries. Working with both the Ministry of Natural Resources and the Federal Department of Fisheries and Oceans on projects related to man-induced groundwater level changes and their real and potential impacts on cold water fisheries. Investigation of groundwater inflow component to wetlands to evaluate potential impacts of urbanization in recharge areas.

Ontario Municipal Board Experience

Representation of clients' interest at six OMB/LPAT hearings (Oro Hills, Penetanguishene, Sturgeon Falls, Uxbridge, Aikensville, Hidden Quarry, Erin Pit) related to gravel pit and quarry applications. Three OMB mediated hearings in relation to septic system impacts (Goderich), quarry application (Owen Sound) and large water taking application (Artemesia).

Source Water Protection/Groundwater Management Studies

Senior hydrogeologist for five-Township groundwater protection study (Artemesia, Melancthon, Osprey, Euphrasia and Town of Blue Mountains) including preparation of recharge/discharge maps, aquifer susceptibility maps, groundwater flow maps and geological maps. Senior hydrogeologist/Project Manager for groundwater management studies for Marathon, Blind River, Burk's Falls, St. Joseph's Island and Gogama (2002-2005). GUDI Study for Val Rita Harty (2018).

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Stan Denhoed, P.Eng., M.Sc.

Senior Hydrogeologist

Supervision of Well Drilling and Water Sampling

Supervision of aquifer testing for water supply and for cone of influence of pumping wells or dewatering systems. Supervision of drilling contractors for the installation of pumping wells. Extensive experience with the evaluation of groundwater movement through fractured rock and the analysis of pumping test data related to confined and unconfined aquifers. Extensive experience in the sampling of well water and evaluation of water quality results.

Document Review/Peer Review

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2011 Phase II Environmental Site Assessment for former wrecking yard in Hamilton, Ontario. Test pit soil samples obtained and tested for inorganic and organic contamination. Estimates of contaminated soils were prepared.

2009 Hydrocarbon contamination of former Township works yard in Puslinch, Ontario. Excavations were made and samples were obtained to determine potential for soil and groundwater contamination.

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Employment History

1993- Present	Harden Environmental Services Ltd., Moffat, Ontario <i>President/Senior Hydrogeologist</i>
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1991- 1992	Keewatin-Aski Ltd., Concord, Ontario <i>Manager of Hydrogeological Projects</i>
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1987- 1990	M.M. Dillon Ltd., Toronto, Ontario <i>Project Hydrogeologist</i>
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1986- 1987	Environment Canada, Burlington, Ontario <i>Research Hydrogeologist</i>
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Associations, Licenses and Committee Participation

Professional Engineers of Ontario

Licensed Water Well Contractor/Technician in the Province of Ontario

Publications

Denhoed, S.E., 1994, *The Role of Sorption in the Accumulation of Arsenic by Peat in the Western Netherlands*, M.Sc. Thesis, Institute for Hydraulic Engineering, Delft, The Netherlands

Denhoed, S.E., Kell, R. and G. Parker., 1990, *Predictive Monitoring of Groundwater Quality at a Municipal Landfill Site*, Proceedings of Canadian Society for Civil Engineers, Annual Conference, Hamilton, Ontario, May 1990

Priddel, M., Jackson, R.E., Novakowski, K.S. and Denhoed, S.E., 1986, *Migration and Fate of Aldicarb in the sandstone Aquifer of Prince Edward Island*, Groundwater in Canada, Special Issue.

Harman, J., McLellan, J. Rudolph, D., Heagle, D, Piller, C. and S. Denhoed, 2001, *A proposed Framework for Managing the Impacts of Agriculture on Groundwater: A Report Prepared For the Sierra/Alert Coalition for Submission in Part 2 of the Walkerton Inquiry*.

Denhoed, S., Warkentin, A., Sarvas, P., 2007, Project Unit 06-031, *Investigation into the Relationship between Groundwater Quality and Geology in Coleman Township, North Eastern Ontario*, Summary of Field Work and Other Activities, Ontario Geological Survey, Open File Report 6213, p26-1 to 26-10.

Presentations

Source Water Protection Conference: Cornwall, Ontario, 2006: *Surface Water / Groundwater Interactions: Mill Creek Experience*

Source Water Protection Committee: Trent Coalition, July 2009: *Groundwater Modelling*

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Ontario Sand, Stone and Gravel Association, 2014, Impacts of Below-Water-Table Extraction in Unconsolidated Materials

Appendix G Qualifications



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