DESKTOP HYDROGEOLOGICAL INVESTIGATION
(REVISION 1)

BLOOR WEST VILLAGE, TORONTO, ONTARIO

PROJECT NO.: 171-11399-00
DATE: APRIL 2018

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April 27, 2018

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Subject: Desktop Hydrogeological Investigation (Revision 1)
Bloor West Village, Toronto, Ontario
Project No.: 171-11399-00

WSP is pleased to present our Desktop Hydrogeological Investigation report for the above-noted study area. The report summarizes the available hydrogeological literature and describes the interpreted hydrogeological conditions within the study area and provides conclusions and recommendations for your consideration.

We trust that this information is sufficient for your current needs. If you have any questions or require further information, please contact us.

Yours truly,

for
Martin Gedeon, M.Sc., P.Geo.
Manager, Hydrogeology

Gord Jarvis
Team Lead - Environment

WSP ref.: 171-11399-00

SIGNATURES

PREPARED BY

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1 EXECUTIVE SUMMARY

WSP Canada Inc. was retained by DTAH to conduct a desktop hydrogeological investigation at the Bloor West Village Avenue Study Area, Toronto, Ontario as shown in **Figure 1**. The desktop hydrogeological evaluation of groundwater conditions is in support of a larger overall study of the area to assess land uses, transportation and servicing infrastructure, community services and facilities, built from character and redevelopment potential for Bloor Street West between Keele Street and the Humber River.

This desktop hydrogeological investigation was initiated to address concerns raised through the City's previous and ongoing public consultations regarding the existing hydrogeological conditions in the study area; as well as to identify constraints to opportunities for proposed intensification and growth in the area. It has become apparent to the City and the project team that hydrogeological concerns as it relates to an underground river valley in the vicinity of High Park along with overall dewatering impact issues are important to stakeholder, as such, this hydrogeological assessment was undertaken.

As part of this work, WSP undertook a desktop hydrogeological study that includes developing relevant geological / hydrogeological cross-sections of the study area; reviewing of background information related to local hydrogeological studies and review evidence to support the presence/absence of the Laurentian buried river valley along with any documentation within the study area.

Based on the results of our investigation, the following is this study's conclusions:

1. The soil conditions within the study area based on WSP's review of available geotechnical, environmental and hydrogeological reports and TRCA and City of Toronto data generally consisted of a layer of asphalt or topsoil with thickness of up to 300mm. Underlying the asphalt and/or topsoil layer was fill materials consisting of various materials extending to depths up to 6 mbgs at the various paved areas and/or areas of previous construction. Below the fill material, native overburden material was documented ranging from 6 up to approximately 58 mbgs. The native overburden soils consisted of layers of coarse-textured glaciolacustrine deposits consisting of sand, gravel, minor silt and clay along the eastern and western portions of the study area while the central portions of the study area near High Park consists of undifferentiated older tills, may include stratified deposits (Figure 2).
2. The bedrock valley was found to be, based on the available borehole log information, up to 58 mbgs within the study area. The western portion of the study area (near the Humber River) has approximately 5 meters of overburden before bedrock is encountered. The eastern portion of the study area has approximately 50 meters of overburden. However, in general bedrock depths within the study area are not well defined due to limited data.
3. Cross sections developed by the Oak Ridge Moraine Groundwater Program illustrate the predicted depths of the bedrock along the study area. This visualization of the available data shows that the predicted bedrock valley is deepest near High Park at approximately at an elevation of 20 masl (i.e. 90 mbgs).
4. Based on the MOECC water well records (WWRs) search, there are ninety-eight (98) water well records within 500 m of the site. One (1) is described as water supply (domestic) wells that was installed in 1959 but was reportedly decommissioned and capped. The site is located in a high density urban residential area in Toronto, which is fully serviced by municipal water supply. All other water well records consisted of test holes, observation and monitoring wells, dewatering wells or were abandonment records. It is anticipated that there are no groundwater users in the area.

5. Based on available reports, groundwater levels throughout the study area can range from a 12 to 20 meters below ground surface in the shallow overburden.
6. A confined groundwater aquifer was encountered at depths of over 35 mbg in the High Park area, and is interpreted to be situated in the west branch of the Laurentian Valley. Based on drilling activities in the High Park area this is a deep artesian aquifer with a potentiometric level higher than existing ground level. Based on the information reviewed the deep aquifer was encountered underlying an approximately 20 m thick clay aquitard (confining layer).
7. No Single Well Response Test (SWRT) data was available to assess in-situ hydraulic conductivity throughout the study area. Monitoring wells installed throughout the study area by others, based on the reports reviewed, did not report hydraulic conductivity values.
8. Groundwater quality monitoring as documented by others for sites within the study area showed groundwater quality is generally specific to localized sites and can vary greatly from one site to another. Typical groundwater exceedances of City of Toronto discharge criteria may include total suspended solids (TSS) and total metals such as total phosphorus, total manganese and total zinc. Hence, a localized treatment system could be needed prior to discharge into city infrastructure for any future development. Overall, groundwater quality is not expected to be negatively affected by residential re-development within the study area as the study area has been urbanized for many years and any new development would need to ensure that groundwater captured will meet the discharge quality criteria prior to discharge into City sewer infrastructure.

The following is this study's recommendation:

1. The potential impact of intensification (i.e., new re-developments) on shallow groundwater regime is possible however the magnitude of the impacts are considered rather low especially if future development is limited to underground levels similar to currently existing structures and/or above the water table.
2. Any development application proposed within the study area should be subject to a detailed hydrogeological review if the proposed underground elevation is below the water table, in order to confirm no impedance of aquifer or hydrogeological impacts through an appropriate assessment and monitoring program.
3. Limit the maximum depth of sub-surface structures in order to ensure no net impact to the shallow groundwater regime.
4. Further deep in-situ drilling programs are needed to evaluate the predicted bedrock valley depth, delineate the spatial extent, and quantify the head pressures from each distinct stratigraphic unit.
5. Investigate enhanced area-specific recharge in order to ensure no net impact to the groundwater regime.

2 INTRODUCTION

WSP Canada Inc. was retained by DTAH to conduct a desktop hydrogeological investigation at the Bloor West Village Avenue Study Area, Toronto, Ontario as shown in **Figure 1**. The desktop hydrogeological evaluation of groundwater conditions is in support of a larger overall study of the area to assess land uses, transportation and servicing infrastructure, community services and facilities, built from character and redevelopment potential for Bloor Street West between Keele Street and the Humber River.

2.1 Desktop Hydrogeological Investigation Purpose

This desktop hydrogeological investigation was initiated to address concerns raised through the City's previous and ongoing public consultations regarding the existing hydrogeological conditions in the study area; as well as to identify constraints to opportunities for proposed intensification and growth in the area. It has become apparent to the City and the project team that hydrogeological concerns as it relates to an underground river valley in the vicinity of High Park along with overall dewatering impact issues are important to stakeholder, as such, this hydrogeological assessment was undertaken.

2.2 Methodology

The desktop hydrogeological investigation study included:

- Reviewing available background information of local geological and hydrogeological studies, including published academic journals, conservation authority reports and mapping including the York, Peel Durham, Toronto and Conservation Authorities Moraine Coalition (YPDT-CAMC), Ministry of Environment and Climate Change (MOECC) Water Well Record (WRR) database, and reports from private environmental engineering consultants;
- Developing relevant geological / hydrogeological Cross-sections of the study area based on queries to the YPDT-CAMC database;
- Reviewing information related to the location and depth of the buried Laurentian Valley; and,
- Summarizing the project related information into a Desktop Hydrogeological Investigation report.

2.3 Study Area Description

The Site is located in the western portion of the City of Toronto. This Study is being conducted by a consulting team led by DTAH and includes R.E. Millward + Associates Ltd., WSP | MMM Group Limited, Swerhun, Taylor Hazell Architects, and J.C. Williams Group. The Bloor West Village Avenue Study Area covers approximately 2.75 km of Bloor Street West between Keele Street and the Humber River and includes all properties fronting on Bloor Street. The Study Area may be further subdivided through the Study process to address changes in land use designations, local character and Official Plan policy directions related to growth, stability and transition.

The area between Keele Street and the Humber River Valley from the CPR rail corridor south to the Lakeshore is characterized by an extensive tree canopy and prominent and significant green spaces. Key natural features are contained within the Official Plan natural heritage system and include High Park, High Park ESA, High Park Oak Woodland ANSI, South Kingsway (West Flank) ESA, and the Lower Humber River provincially significant wetland.

The study area location is shown in **Figure 1**. Lake Ontario is located approximately 2km south of the study area. The topography in the vicinity of the study area generally slopes to the south towards Lake Ontario hence the inferred shallow groundwater flow direction of the Site is also in the same general direction towards Lake Ontario and more locally towards the Humber River on the western portion of the site.

2.4 Geology/Soil Stratigraphy

The soil conditions with study area based on WSP's review of available geotechnical, environmental and hydrogeological reports and TRCA and City of Toronto data generally consisted of a layer of asphalt or topsoil with thickness of up to 300mm. Underlying the asphalt and/or topsoil layer was fill materials consisting of various materials extending to depths up to 6 mbgs at certain locations. Below the fill material, native overburden materials were documented ranging from 6 up to approximately 58 mbgs. The native overburden soils consisted of layers of coarse-textured glaciolacustrine deposits consisting of sand, gravel, minor silt and clay along the eastern and western portions of the study area while the central portions of the study area near High Park consists of undiferenitated older tills, may include stratified deposits (**Figure 2**).

The bedrock valley was found to be, based on the available borehole log information, up to 58 mbgs within the study area. The western portion of the study area (near the Humber River) has approximately 5 meters of overburden before bedrock is encountered. The eastern portion of the study area has approximately 50 meters of overburden. However, in general bedrock depths within the study area are not well defined due to limited data.

Cross sections developed by the Oak Ridge Moraine Groundwater Program illustrate the predicted depths of the bedrock along the study area. This visualization of the available data shows that the predicted bedrock valley is deepest near High Park at approximately at an elevation of 20 masl (i.e. 90 mbgs) as shown in **Figures 4 and 6A to 6F**.

3 LITERATURE REVIEW

WSP reviewed various forms of data which included academic journal articles, City of Toronto reports and permit applications, Toronto and Region Conservation Authority (TRCA) cross-sections and reports, geotechnical, hydrogeological and environmental reports completed by consultants on private lands within the study area and Ministry of the Environment and Climate Change (MOECC) Water Well Record (WWR) database. WSP's findings are presented below:

3.1 ACADEMIC JOURNAL REVIEW

WSP completed a comprehensive search of academic journals related to geology and hydrogeology in the vicinity of the Study Area. The list of articles reviewed can be found in section 7 of this report.

The earliest documented hypothesis that a pre-glacial stream drained the present Great Lakes area was proposed by J.W.W. Spencer (Spencer, 1881). The stream referred to as the Laurentian River was considered to flow in a valley which crossed the Ontario Peninsula from Georgian Bay to a point near Toronto (White et Karrow, 1971). Coleman subsequently suggested that the Toronto interglacial beds were deposited by a successor of the Laurentian River but that the valley reached Lake Ontario at Humber Bay (western Toronto). Since then, several others have added more information to the voids in the data. Data suggests that Spencer's hypothesis is probable and that the drainage way was still in use at the end of the last interglacial (approx. 70,000 years ago) and that at least major portions of the oak ridges moraine were built after that time.

Flow patterns in the area is the structure of Precambrian, Paleozoic and Pleistocene strata. A major northeast trending structure in Shield rocks (Easton, 1992) may control the position of lakes on the edge of the Precambrian / Paleozoic contact and possibly the orientation of the bedrock valleys that occur in the northern oak ridges moraine area (Scheidegger, 1980; Eyles et al., 1995). Paleozoic bedrock valleys are also aligned with northwest and northeast trending fracture patterns (Sanford et al., 1985), and likely pre-glacial drainage networks that preferentially eroded softer shale (Spencer, 1881). These lakes and structures have likely been enhanced by glaciofluvial erosion (Gilbert and Shaw, 1994). In addition, a network of valleys or channels occurs in the thick glacial sediment of the oak ridges moraine area (Russell et al., 2003). Underlying structure and bedrock morphology are controls on regional channel network of the oak ridges moraine (**Figure 3**).

Early work on the oak ridges moraine did not explicitly recognize the large glacial channels (e.g., Duckworth 1979 and Chapman, 1985), despite the fact that basin analysis methods were employed (Eyles et al., 1985). Groundwater studies relied on early use of water wells and geologic mapping (e.g. Karrow, 1959; 1963; 1967). Early work (Spencer, 1897; and Scarborough Bluffs) that recognized buried valleys, attributed these valleys to low base level and non-glacial conditions (Karrow, 1967).

3.2 Toronto and Region Conservation Authority (TRCA) Reports

The interpreted bedrock topography across the program study area is shown in **Figure 4.** The Laurentian Channel is hypothesized to connect Georgian Bay to Lake Ontario and may be a significant conductor of groundwater on a regional scale. The main channel has been traced north to Nobleton, continuing northward trending west of Barrie, and up into Georgian Bay with tributaries extending as far west as the Niagara Escarpment near Caledon East. The High Park monitoring location is shown to be situated within the interpreted west branch of the Laurentian Channel in the Toronto area (**Figure 5A and 5B**). Details regarding the sediment stratigraphy within the Laurentian valley and groundwater movement within the feature remain uncertain despite the valley having been documented for over 100 years (Spencer, 1881).

YPDT-CAMC, High Park Monitoring Wells

Based on information gathered from the Oak Ridge Moraine Groundwater Program and TRCA website, two (2) flowing wells that were first drilled in 1959 were decommissioned as part of a stormwater management project in High Park. The flowing wells were found during construction work on the existing stormwater ponds within High Park. Well records for the deepest well indicated that bedrock had not been encountered when the well was terminated at a depth of 38.4 m below ground surface. Based on this, as well as on previous investigations (e.g. Eyles, 1987; Eyles et al., 1993; Gill and Greenhouse, 1996; Lewis and Sly, 1971; Rogers et al., 1961; Sharpe, 1980; Watt, 1968; White and Karrow, 1971), it was suspected that one of the main outlets of the Laurentian River was located in the vicinity of High Park. The York, Peel, Durham, Toronto and The Conservation Authorities Moraine Coalition (YPDT-CAMC) study sought to fill this data gap since there are few boreholes within this area of the City of Toronto, by drilling a continuously cored borehole in this valley feature.

An initial borehole (BH1) was drilled to the top of a gravel aquifer at 37 mbgs in July 2003 by All-Terrain Drilling by first installing a concrete casing through which the borehole was advanced, in anticipation of artesian groundwater pressures. It is documented that the borehole started flowing from 37 m depth during drilling, expelling water and sediment into the air (initial hydraulic head was on the order of 18 to 23 m above ground surface). The crew immediately attempted to seal the borehole within the casing, but that resulted in the two recently capped artesian wells situated within the stormwater ponds to begin to flow again and springs emerged from the area surrounding the borehole.

Following this incident, a relief production well was installed by G. Hart and Sons, which depressurized the aquifer sufficiently to allow for the initial borehole and springs to be grouted and sealed. During the drilling of the relief production well, bedrock was encountered at a depth of 44 mbgs (45 masl). The water levels in the three (3) shallow monitoring wells (OW1, OW2, OW3) show connection to the deeper aquifer. To this day, controlled flow from the relief well (PW1) to a local creek (Spring Creek) continues to depressurize the aquifer and monitoring of groundwater levels and flow rates is ongoing (**Figure 5A and 5B**).

Even though the drilling location is in near proximity to Lake Ontario, the highly confined conditions suggest that hydraulic communication between the Laurentian Valley aquifer at the High Park location and Lake Ontario to the south is poor. TRCA acknowledges that further testing is required to fully quantify the hydraulic properties of the aquifer system.

3.3 REPORTS FROM PRIVATE CONSULTANT COMPANIES

Prior to this desktop study, other consultants (Construction Control Inc, SPL/WSP, Terraprobe, EXP) had completed geotechnical, environmental and hydrogeological reports for various sites within the study area (**Appendix D**). These reports were provded to WSP by the City of Toronto for review. These available reports were reviewed and key findings are summarized below:

Construction Control Inc - Geotechnical Report – 2114 Bloor Street West, January 2012

- Drilling five (5) boreholes, BH1 through BH5. Borehole BH1 was drilled to depth of 34.2 m, BH2 to depth 28.4 m, BH3 to a depth of 20.3, BH4 to depth of 19.8 m and BH5 to a depth of 24.5 m
- The existing development consists of a two storey building with a parking area to the north of the building. The proposed development will consist of a twelve to fifteen storey residential building with three to five underground parking levels. The approximate depth of the underground parking levels will range between 10 m and 16 m below the exiting grade.
- In general, the subsurface conditions encountered at all borehole locations consisted of surficial materials and fill overlying native soil. Groundwater was encountered in all of the boreholes.
- Fill ranged from 6.5 to 9 mbgs while native sandy soils were encountered up to 18 mbgs and clayey silt/silty clay soils encountered at approximately 27 mbgs. The inferred bedrock was believed to be at 34.2 mbgs but was not verified by coring.

SPL (WSP) – Geotechnical Report – 2115 Bloor Street West, February 2015

- It is understood that the proposed building will have two levels of basement, with P2 basement floor at about Elev. 102.0m
- Three boreholes (BH11-1 to BH11-3) were drilled at the site to depths ranging from about 22 to 24 m.
- Below the topsoil and/or concrete found at the site, fill materials were found up to 4.1 mbgs. The fill materials in the boreholes consisted of very loose to compact sand and silty sand, with inclusions of topsoil and roots.
- The native soils below the fill generally consisted of dense to very dense fine sand, extending to the explored depth of the boreholes. The sand generally contains some silt and trace clay. Some of the sand deposit was silty. The sand deposits also contain clayey silt layers and pockets. Boulders and cobbles should be anticipated in the sand deposits.
- The groundwater table measured the monitoring wells was at a depth of 21.6 m (Elevation 86.1 m) in BH11-1, and at a depth of 23.9 m (Elevation 86.4 m) in BH11-3. No groundwater was observed in the monitoring well in BH11-2. During the drilling of BH11-2, wet soil sample was found below a depth of 21.3 m (Elevation 87.0 m).

Terraprobe: Geotechnical report, Grenadier Square, January 2016

- The proposed development site is located directly north of high park (between Quebec and Park Ave)
- Two (2) levels of underground parking are proposed (finished floor elevation at 106 masl).
- In total six (6) borehole including three (3) monitoring wells were installed ranging from 5.5 to 12.2 mbgs (107.7 to 99.6 masl).

- After multiple attempts to take water levels from the installed monitoring wells, all wells were recorded as dry.

Terraprobe - Hydrogeological conditions opinion letter, High Park Village, December 2016

- The proposed development is for a site comprised of four (4) residential high rises and two (2) townhouse complexes. A portion of the building tower will have two (2) levels of basement with the ability to extend to four (4) levels of basement without the need to activity dewater.
- Terraprobe report indicates GW >112.9 masl (12.3 mbgs)
- TTC subway tunnel lies immediately south of the high park village site with TTC tracks 9 mbgs
- TTC borehole (1950s and 1960s) indicates GW at 18 mbgs (93 masl) (**Appendix A**)
- TTC borehole indicate site is thick sand deposit, very dense below 4m. Sand from 4 to 30 mbgs, 30 to 58 glacial till, below 58m is bedrock. (**Appendix A**)
- If new structure intersects the water table (at approximately basement level 5) relatively large quantities of GW will need to be drained from structure or waterproofed. The estimate quantity of water expect is approximately 436,000 L/day.

EXP geotechnical report, 255 Glenlake Avenue, 111 Pacific Avenue & 66 Oakmount Road, Toronto, Ontario, Feb 2017

- It is understood that an additional two (2) towers, a mid-rise building and townhouse are proposed. The basement below Towers 1 and 2 and the mid-rises will be deepened from two (2) to three (3) levels to accommodate additional parking.
- In total eighteen (18) boreholes were drilled
- Below the topsoil and/or concrete found at the site, fill materials were found up to 5.6 mbgs. The fill consists of fine grained silty sand with localized minor amounts of gravel, rootlets, decayed vegetation, stone, red brick, and shale fragments, wood fragments, fragments and silt to clayey silt pockets.
- The native soils below the fill generally consisted of silt down to 8.6 mbgs (~106.1 masl) and silty sand which terminates at depths of approximately 11.1 to 15.7 m below exterior grade (~97.9 to 103.7 masl)
- Groundwater was detected at approximately 11.0 to 15.2 m depth upon completion of drilling.
- All boreholes were dry on completion of drilling except Boreholes 2, 5 and 9. After an elapsed time of 15 days, water was recorded at approximately 12.4 m depth (~Elevation 101.2 m) in the monitoring well installed in Borehole 5. The remaining monitoring wells remained dry after the elapsed times of 5 to 15 days.

3.3.1 SHALLOW GROUNDWATER ELEVATION MONITORING

Groundwater levels were measured by various companies throughout the study area. **Table 1** presents a summary of the measured potentiometric groundwater elevations (groundwater levels) from the reports reviewed.

Table 1- Summary of Groundwater Potentiometric Elevations

Company	Borehole	Soil/Rock Description	Date of Measurement	Groundwater Depth (m)	Groundwater Potentiometric Elevation (masl)
Terraprobe	204	Sand	4-Jan-16	>12.6 (dry)	<100.6
Terraprobe	205	Sand	4-Jan-16	>12.4 (dry)	<99.4
Terraprobe	206	Sand	4-Jan-16	>12.6 (dry)	<100.3
EXP	1	Silty Sand	21-Apr-16	>10.67 (dry)	<103.7
EXP	2	Silty Sand	26-Apr-16	>11.02 (dry)	<103
EXP	4	Silty Sand	21-Apr-16	>10.67 (dry)	<103.7
EXP	5	Silty Sand	26-Apr-16	12.36	101.2
EXP	6	Silty Sand	21-Apr-16	>12.04 (dry)	<101.6
EXP	7	Silty Sand	21-Apr-16	>10.67 (dry)	<102.5
EXP	8	Silt	26-Apr-16	>10.67 (dry)	<102
EXP	9	Silty Sand	26-Apr-16	>15.19 (dry)	<97.9
SPL/WSP	BH11-1	Sand	8-Jul-2011	21.6	86.1
SPL/WSP	BH11-2	Sand	8-Jul-2011	> 21.3 (dry)	<87.0
SPL/WSP	BH11-3	Sand	8-Jul-2011	23.9	86.4
Construction Control Inc	BH1	Sand	7-Dec-2011	19.2	~82.0
Construction Control Inc	BH2	Sand	7-Dec-2011	18.3	~82.28
Construction Control Inc	BH3	Silty Sand	7-Dec-2011	18.2	~82.11
Construction Control Inc	BH4	Clayey Silt	7-Dec-2011	18.25	~82.02
Construction Control Inc	BH5	Sand	7-Dec-2011	18.0	~81.75

Based on the available groundwater potentiometric elevations documented in the reports reviewed above the localized groundwater in the overburden is between 12 to 21 mbgs (101 to 82 masl). TTC borehole records from the 1950s and 1960s show that the groundwater near the subway tunnel was approximately 18 mbgs (~93 masl).

3.3.2 GROUNDWATER FLOW DIRECTION

Based on the groundwater elevation measurements as presented in **Table 1** and from regional hydrogeological contour maps, the inferred shallow groundwater flow direction is towards Lake Ontario and more locally towards the Humber River on the western portion of the study area. Lake Ontario is located approximately 2000 m south study area.

3.3.3 Single Well Response Tests (SWRTS)

No Single Well Response Test (SWRT) data was available to assess in-situ hydraulic conductivity throughout the study area. Monitoring wells installed throughout the study area by others, based on the reports reviewed, did not report hydraulic conductivity values.

3.3.4 GROUNDWATER QUALITY

Groundwater quality monitoring as documented by others for sites within the study area showed groundwater quality is generally specific to a localized site and can vary greatly from one site to another. Typical groundwater exceedances of City of Toronto discharge criteria may include total suspended solids (TSS) and total metals such as total phosphorus, total manganese and total zinc hence a localized treatment system could be needed prior to discharge into city infrastructure.

4 DATABASE SEARCHES

4.1 YPDT-CAMC (YORK- PEEL DURHAM-TORONTO / CONSERVATION AUTHORITIES MORAINE COALITION) DATABASE

With assistance from of the City of Toronto, YPDT-CAMC and Oak Ridge Moraine Groundwater Program cross sections were developed of the study area using the YPDT-CAMC database. The database utilities all available information and produces cross-sections and figures using modeling software that allows for the visualization of many data points of the associated study area. **Figures 4 and 6A to 6F** illustrate these cross-sections.

As part of the YPDT-CAMC High Park program, a monitoring well was installed in 2003 as shown in **Figure 5A and 5B**. The initial well was drilled to the top of a gravel unit at 37 mbgs at which a highly pressurized aquifer was penetrated resulting in groundwater artesian conditions. The well was eventually sealed and a relief production well was installed to depressurize the aquifer. During the drilling of the relief production well, bedrock was encountered at a depth of 44 mbgs (45 masl). Three (3) shallow monitoring wells (OW1, OW2, OW3) were also installed to show connection to the deeper aquifer. Currently, controlled flow from the relief well (PW1) to a local creek continues to depressurize the aquifer and monitoring of groundwater levels and flow rates is ongoing. As shown in **Appendix C**, the graph prepared by YPDT-CAMC shows the flow rate decreasing within the production well over time. This could also mean that the production well's efficiency is decreasing due to various factors including build-up of materials along the well screen or it could suggest that the aquifer has been effectively depressurized locally since it's been in continuous use since 2003.

4.2 MOECC WATER WELL RECORD (WWR) DATABASE

As part of the hydrogeological study, WSP completed a search of the MOECC WWR database. In the MOECC WWR, ninety-eight (98) water well records were found for the area within 500 m of the subject site shown in **Figure 1**. Of the ninety-eight (98) water well records found, one (1) is described as water supply (domestic) wells that was installed in 1959 but was told that it was decommissioned and capped since then (**Appendix A**). The site is located in a high density residential area which is fully serviced by a municipal water supply. In total, based on the information available, all other water well records consisted of test holes, observation and monitoring wells or were abandonment records (**Appendix B**).

5 POTENTIAL IMPACTS

We understand that the City of Toronto is undertaking an Avenue Study to assess the land uses, transportation and servicing infrastructure, community services and facilities, and redevelopment potential for Bloor Street West between Keele Street and the Humber River. Based on the information summarized in this Desktop Hydrogeological Assessment the existing hydrogeological conditions vary within the study area; including various depths of fill materials overlying overburden materials comprised of coarse textured glaciolacustrine deposits in the western and eastern portions of the study area; and, undifferentiated older till with possible stratified deposits in the central portion of the study area. The depth to bedrock ranged from about 5 mbg in the western portion (near Humber River), extending to potentially 90 mbg near High Park (central portion of study area), and approximately 50 mbg in eastern extent of the study area. The depth to the shallow groundwater levels in the overburden in the study area ranged between 12 to 21 mbg. A confined groundwater aquifer was encountered at depths of over 35 mbg in the High Park area that is interpreted to be situated in the west branch of the Laurentian Valley. Based on drilling activities in the High Park area this is a deep artesian aquifer with a potentiometric level higher than existing ground level.

5.1 SHALLOW GROUNDWATER REGIME

As identified in Section 3.3.1, based on information reviewed as part of the assessment, the depth to the shallow groundwater levels in the overburden in the study area ranged between 12 to 21 mbg. It should be expected that the depth to groundwater in the western portion of the study area, where bedrock was identified to be about 5 mbg, would be encountered at shallow depths. Also, infiltration rates through the unsaturated zone of the overburden materials will be expected vary with the differing soils identified in the study area.

Due to the existing network of infrastructure and developments within the study area, the potential impacts and cumulative effects to the shallow groundwater regime through creation of impermeable surfaces in the study area would be expected to be minor, however, site specific information will need to be obtained to identify soil and groundwater conditions; including groundwater levels, infiltration rates, potential seepage rates, groundwater flow patterns, quantify potential construction groundwater control requirements, and potential development constraints and mitigation measures, as well as determine opportunities for low impact development including water balance assessment.

5.2 DEEP AQUIFER SYSTEM

As identified in Section 3.2, a confined groundwater aquifer was encountered at depths of over 35 mbg in the High Park area, and is interpreted to be situated in the west branch of the Laurentian Valley. Based on drilling activities in the High Park area this is a deep artesian aquifer with a potentiometric level higher than existing ground level. Based on the information reviewed the deep aquifer was encountered underlying an approximately 20 m thick clay aquitard (confining layer). Given the limited information available for the characteristics and extent of the aquifer, site specific information will need to be obtained to identify the potential development constraints in the area that the aquifer has been identified, including determination of potentiometric level, calculation of safe excavation depths, and aquifer characterization testing, at a minimum.

5.3 SHORT TERM CONSTRUCTION DEWATERING

Based on the reviewed geotechnical and hydrogeological reports, short term dewatering at future development sites (with no more than 4 levels of basement) in the vicinity of the study area have been recommended by various consulting firms. Generally, these reports have indicated that the depth of excavation should be limited to the water table depths. If the proposed excavation depth is lower than the determined water table, engineered solutions would be needed to mitigated groundwater flow into the excavation. If the groundwater is not mitigated, it is possible that dewatering will yield significant quantities of water during construction. Please note that each proposed development site should be evaluated

independently to verify the localized water table, area of excavation base, proposed depth of excavation and local geology to determine the estimated dewatering rates during construction.

It should be noted that a groundwater management policy is currently under development by Toronto Water and is expected to set a priority for onsite groundwater management (where possible) prior to any allowable permanent groundwater discharge into the City's sewer system.

5.4 DEWATERING AREA OF INFLUENCE

If a dewatering system must be designed to lower the potentiometric groundwater elevation within the excavation, the maximum predicted radius of influence from the edges of the excavations is considered to be limited to the excavation area only if caisson walls or other mitigated excavation techniques are used. If dewatering is undertaken using an open-cut or non-mitigated construction technique the zone of influence due to dewatering of the excavation area can be significant. Impacts to local groundwater users or surface water bodies within the predicted zone of influence should be considered prior to any water taking.

5.5 LONG TERM DRAINAGE

Once the proposed building/structure is constructed, long term groundwater flow to the underdrain system for the buildings/underground parking will be a function of the upward flux through the underlying soils, leakage through shoring system around the building/underground parking and the infiltration rate at the site via the foundation walls. Each proposed development site should be evaluated independently to verify the localized water table, area of excavation base (building footprint), depth of foundation and local geology to determine the estimated dewatering rates that can be expected long term. It is possible that the water flux entering the drainage system of a building can be significant, hence as part of the overall feasibility and permitting evaluation sewer infrastructure capacity should be reviewed. Alternatively, if the building is constructed as a water tight structure there will be minimal quantities of water that will require sewer discharge.

The potential impact of intensification (i.e., new re-developments) on groundwater tables is possible however the magnitude of the impacts are considered rather low especially if future development is limited to underground levels similar to currently existing structures and/or above the water table.

It should be noted that a groundwater management policy is currently under development by Toronto Water and is expected to set a priority for onsite groundwater management (where possible) prior to any allowable permanent groundwater discharge into the City's sewer system.

5.6 WATER QUALITY

Groundwater quality monitoring as documented by others for sites within the study area showed groundwater quality is generally site-specific and can vary greatly from one site to another. Typical groundwater exceedances of City of Toronto discharge criteria may include total suspended solids (TSS) and total metals such as total phosphorus, total manganese and total zinc. Hence, a localized treatment system could be needed prior to discharge into city infrastructure during any potential construction dewatering. Groundwater quality is not expected to be negatively affected by residential re-development within the study area as the study area has been urbanized for many years and any new development would need to ensure that groundwater captured as part of the short term (construction) and long term will meet the application discharge quality criteria prior to discharge into City sewer infrastructure. Furthermore, re-development could potential improve downstream water quality if the recaptured groundwater has concentrations of parameters in exceedance of City of Toronto discharge criteria which would require treatment prior to discharge.

6 CONCLUSIONS & RECOMMENDATIONS

Based on the results of our investigation, the following summary of conclusions and recommendations is presented.

6.1 CONCLUSIONS

1. The soil conditions within the study area based on WSP's review of available geotechnical, environmental and hydrogeological reports and TRCA and City of Toronto data generally consisted of a layer of asphalt or topsoil with thickness of up to 300mm. Underlying the asphalt and/or topsoil layer was fill materials consisting of various materials extending to depths up to 6 mbgs at the various paved areas and/or areas of previous construction. Below the fill material, native overburden material was documented ranging from 6 up to approximately 58 mbgs. The native overburden soils consisted of layers of coarse-textured glaciolacustrine deposits consisting of sand, gravel, minor silt and clay along the eastern and western portions of the study area while the central portions of the study area near High Park consists of undifferentiated older tills, may include stratified deposits (Figure 2).
2. The bedrock valley was found to be, based on the available borehole log information, up to 58 mbgs within the study area. The western portion of the study area (near the Humber River) has approximately 5 meters of overburden before bedrock is encountered. The eastern portion of the study area has approximately 50 meters of overburden. However, in general bedrock depths within the study area are not well defined due to limited data.
3. Cross sections developed by the Oak Ridge Moraine Groundwater Program illustrate the predicted depths of the bedrock along the study area. This visualization of the available data shows that the predicted bedrock valley is deepest near High Park at approximately at an elevation of 20 masl (i.e. 90 mbgs).
4. Based on the MOECC water well records (WWRs) search, there are ninety-eight (98) water well records within 500 m of the site. One (1) is described as water supply (domestic) wells that was installed in 1959 but was reportedly decommissioned and capped. The site is located in a high density urban residential area in Toronto, which is fully serviced by municipal water supply. All other water well records consisted of test holes, observation and monitoring wells, dewatering wells or were abandonment records. It is anticipated that there are no groundwater users in the area.
5. Based on available reports, groundwater levels throughout the study area can range from a 12 to 20 meters below ground surface in the shallow overburden.
6. A confined groundwater aquifer was encountered at depths of over 35 mbg in the High Park area, and is interpreted to be situated in the west branch of the Laurentian Valley. Based on drilling activities in the High Park area this is a deep artesian aquifer with a potentiometric level higher than existing ground level. Based on the information reviewed the deep aquifer was encountered underlying an approximately 20 m thick clay aquitard (confining layer).
7. No Single Well Response Test (SWRT) data was available to assess in-situ hydraulic conductivity throughout the study area. Monitoring wells installed throughout the study area by others, based on the reports reviewed, did not report hydraulic conductivity values.
8. Groundwater quality monitoring as documented by others for sites within the study area showed groundwater quality is generally specific to localized sites and can vary greatly from one site to another. Typical groundwater exceedances of City of Toronto discharge criteria may include total suspended solids

(TSS) and total metals such as total phosphorus, total manganese and total zinc. Hence, a localized treatment system could be needed prior to discharge into city infrastructure for any future development. Overall, groundwater quality is not expected to be negatively affected by residential re-development within the study area as the study area has been urbanized for many years and any new development would need to ensure that groundwater captured will meet the discharge quality criteria prior to discharge into City sewer infrastructure.

6.2 RECOMMENDATIONS

Based on the information reviewed as part of this desktop Hydrogeological Assessment, it is recommended that:

1. The potential impact of intensification (i.e., new re-developments) on shallow groundwater regime is possible however the magnitude of the impacts are considered rather low especially if future development is limited to underground levels similar to currently existing structures and/or above the water table.
2. Any development application proposed within the study area should be subject to a detailed hydrogeological review if the proposed underground elevation is below the water table, in order to confirm no impedance of aquifer or hydrogeological impacts through an appropriate assessment and monitoring program.
3. Limit the maximum depth of sub-surface structures in order to ensure no net impact to the shallow groundwater regime.
4. Further deep in-situ drilling programs are needed to evaluate the predicted bedrock valley depth, delineate the spatial extent, and quantify the head pressures from each distinct stratigraphic unit.
5. Investigate enhanced area-specific recharge in order to ensure no net impact to the groundwater regime.

7 REFERENCES

Anderson TW, Terasmae J (1966) Palynological study of bottom sediments in Georgian Bay, Lake Huron. Proc. 9th Conf. Great Lakes Res, 1:164-168.

Coleman AP (1899) Lake Iroquois and its predecessors at Toronto, Geol. Soc. Amer. Bull., 10:165-176.

Coleman, A.P. 1922. Glacial and Post-Glacial Lakes in Ontario. University of Toronto Studies, Ontario Fisheries Research Laboratory, No. 10.

Construction Control Inc., Geotechnical Investigation Report, Proposed Residential Development, 2114 Bloor Street West, Toronto, Ontario. Project No. 11-7837-100. January 13, 2012

Deane RE (1950) Pleistocene geology of the Lake Simcoe district. Ontario. Geol. Survey Canada. Memoir. 256:108.

Dreimanis A (1954) Geology of the Upper Holland Watershed, Ontario. Univ. of West. Ontario, Contrib. Dept. Geol. No. 8, Reprinted from the Upper Holland Valley Conservation Report, 1953. Ontario Dept of Planning and Development, Toronto.

Duckworth PB (1979) The late depositional history of the western end of the Oak Ridges Moraine, Ontario. Canadian Journal of Earth Sciences 16:1094–1107. doi: 10.1139/e79-095

Dyke AS, Prest VK (1987) Late Wisconsinan and Holocene Retreat of the Laurentide Ice Sheet. doi: 10.4095/122842

Eyles N (1986) Late Pleistocene depositional systems of Metropolitan Toronto and their engineering and glacial geological significance. Canadian Journal of Earth Science 24:1009–1021.

Eyles N, Scheidegger AE (1995) Environmental significance of bedrock jointing in Southern Ontario, Canada. Environmental Geology 26:269–277. doi: 10.1007/bf00770478

Eyles N, Boyce J, Mohajer AA (1993) The Bedrock Surface of the Western Lake Ontario Region: Evidence of Reactivated Basement Structures? Géographie physique et Quaternaire 47:269. doi: 10.7202/032957ar

EXP, Geotechnical Investigation (3 Basement Levels) High Park Village at Southeast Corner of Pacific and Glenlake Avenues, Toronto, Ontario (255 Glenlake Avenue, 111 Pacific Avenue, 66 Oakmount Road). Project number BRM-00604162-F0. February 7, 2017.

Gill, B. and J. Greenhouse. 1996. Toronto Gravity Survey, Final Report, Project 96102.

Karrow PF (1969) Stratigraphic studies in the Toronto Pleistocene; Geol. Assoc. Can. Proc, 20:4-16.

Larson G, Schaetzl R (2001) Origin and Evolution of the Great Lakes. Journal of Great Lakes Research 27:518–546. doi: 10.1016/s0380-1330(01)70665-x

Lewis C.F.M, King JW, Blasco SM, et al (2008) Dry Climate Disconnected the Laurentian Great Lakes. Eos, Transactions American Geophysical Union 89:541–542. doi: 10.1029/2008eo520001

Lewis, C.F.M. and P.G. Sly. 1971. Seismic profiling and geology of the Toronto waterfront area of Lake Ontario. Proceedings of the 14th Conference on Great Lakes Research, International Association of Great Lakes Research, 303-354.

Mccarthy F, Mcandrews J (1988) Water levels in Lake Ontario 4230-2000 years B.P.: evidence from Grenadier Pond, Toronto, Canada. Journal of Paleolimnology 99–113. doi: 10.1007/bf00196067

Pages - High Park. In: OakRidgesWater.ca. https://oakridgeswater.ca/program-elements/hydrogeologic-analysis/high-park. Accessed 1 Sep 2017

Phillips RT, Robert A (2005) River Incision in Relation to Post-Glacial Events in the Humber River Basin, Ontario. Géographie physique et Quaternaire 59:17–30. doi: 10.7202/013734ar

(1892) Review of the Origin of the basins of the Great Lakes. America Association for the Advancement of Science 19:312–313.

Rogers, D.P., R.C. Ostry and P.F. Karrow. 1961. Metropolitan Toronto Bedrock Countours. Ontario Department of Mines, Preliminary Map 102.

Russell H, Arnott R, Sharpe D (2003) Evidence for rapid sedimentation in a tunnel channel, Oak Ridges Moraine, southern Ontario, Canada. Sedimentary Geology 160:33–55. doi: 10.1016/s0037-0738(02)00335-4

Russell HA, Arnott RW, Sharpe DR (2004) Stratigraphic Architecture and Sediment Facies of the Western Oak Ridges Moraine, Humber River Watershed, Southern Ontario. Géographie physique et Quaternaire 58:241. doi: 10.7202/013141ar

Sharpe DR, Dyke LD, Hinton MJ, et al (1996) Groundwater prospects in the Oak Ridges Moraine area, southern Ontario: application of regional geological models. 1–11. doi: 10.4095/207886

Sharpe DR, Pugin A, Pullan SE, Gorrell G (2003) Application of seismic stratigraphy and sedimentology to regional hydrogeological investigations: an example from Oak Ridges Moraine, southern Ontario, Canada. Canadian Geotechnical Journal 40:711–730. doi: 10.1139/t03-020

Sharpe DR, Russell HAJ (2004) Basin Analysis Applied to Modelling Buried Valleys in the Great Lakes Basin. Three-dimensional Geologic Mapping for Groundwater Applications, Workshop Extended Abstracts 81–84. doi: 10.4095/216721

Sharpe DR, Russell HAJ, Pugin A (2013) The significance of buried valleys to groundwater systems in the Oak Ridges Moraine region, Ontario: extent, architecture, sedimentary facies and origin of valley settings in the ORM region. Geological Survey of Canada. doi: 10.4095/292673

Sharpe DR, Balgalvis R Quaternary Geology Toronto and Surrounding Area Southern Ontario. Quaternary geology, Toronto and surrounding area, southern Ontario

Spencer JW (1881) Discovery of the preglacial outlet of the basin of Lake Erie into that of Lake Ontario ; with Notes on the origin of our lower Great Lakes / by J.W. Spencer. doi: 10.5962/bhl.title.45815

SPL, Revised report on prelinary geotechnical investigation proposed building 2115 – 2117 Bloor Street West & 19 Harcroft Road, Toronto, Ontario. Project number 888-1101. February 24, 2015.

Terraprobe, Geotechnical investigation and design report, Grenadier Square, Toronto, Ontario. File No 1-15-0660-01. January 19, 2016.

Terraprobe, Hydrogeological conditions opinion letter, High Park Village Development, High Park Avenue and Pacific Avenue, Toronto, Ontario. File No 1-16-0768-54. December 12, 2016.

Watt, A.K. 1968. Pleistocene Geology and Ground Water Resources, Township of Etobicoke. Ontario Department of Mines, Geological Report 59, 50p.

Weninger JM, Mcandrews JH (1989) Late Holocene aggradation in the lower Humber River valley, Toronto, Ontario. Canadian Journal of Earth Sciences 26:1842–1849. doi: 10.1139/e89-157

White OL, Karrow PF (1971) New Evidence for Spencer's Laurentian River. 14th Conference Great Lakes Research 394–400.

Wilson AWG (1901) Physical geology of Central Ontario. Trans. Can. Inst, 7:163.

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FIGURES

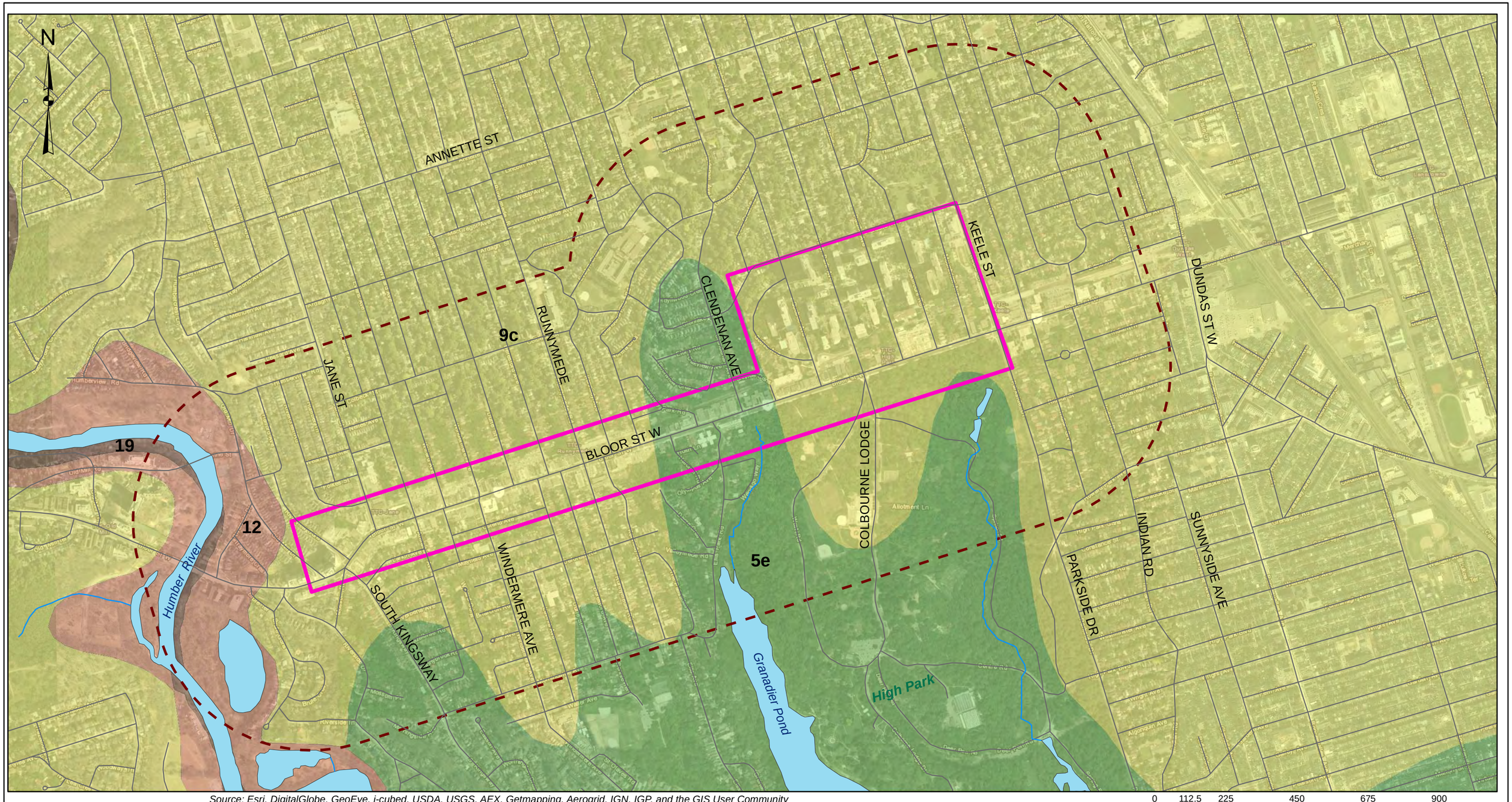
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

0 112.5 225 450 675 900 Meters

Legend:

- Subject Site
- 500m Study Area
- MOECC Water Well Record

Client: **DTAH**		Project No: **171-11399-00**	Figure No: **1**
Drawn: **NS**	Approved: **BK**	Title: **MOECC WATER WELL RECORDS**	
Date: **August 2017**	Scale: **see bar scale**	Project: **HYDROGEOLOGICAL INVESTIGATION BLOOR STREET VILLAGE, TORONTO, ON**	
Original Size: **Tabloid**	Rev: **0**	WSP	51 Constellation Court Toronto, ON M9W 1K4 T: 416-798-0065 F: 416-798-0518



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
The Ontario Geological Survey, 2003. Surficial Geology of Southern Ontario

Legend:

- Subject Site
- 500m Study Area
- 5e - Undiferenitated older tills, may include stratified deposits
- 9c - Coarse-texturedglaciolacustrine deposits: sand, gravel, minor silt and clay
- 12 - Older aluvial deposits: clay, silt, sand, gravel, may contain orgnic remains
- 19 - Modern aluvial deposits: clay, silt, sand, gravel, may contain organic remains

Client: **DTAH**		Project No: **171-11399-00**	Figure No: **2**
Drawn: **NS**	Approved: **BK**	Title: **SURFICIAL GEOLOGY**	
Date: **August 2017**	Scale: **see bar scale**	Project: **HYDROGEOLOGICAL INVESTIGATION BLOOR STREET VILLAGE, TORONTO, ON**	
Original Size: **Tabloid**	Rev: **0**		

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51 Constellation Court
Toronto, ON M9W 1K4
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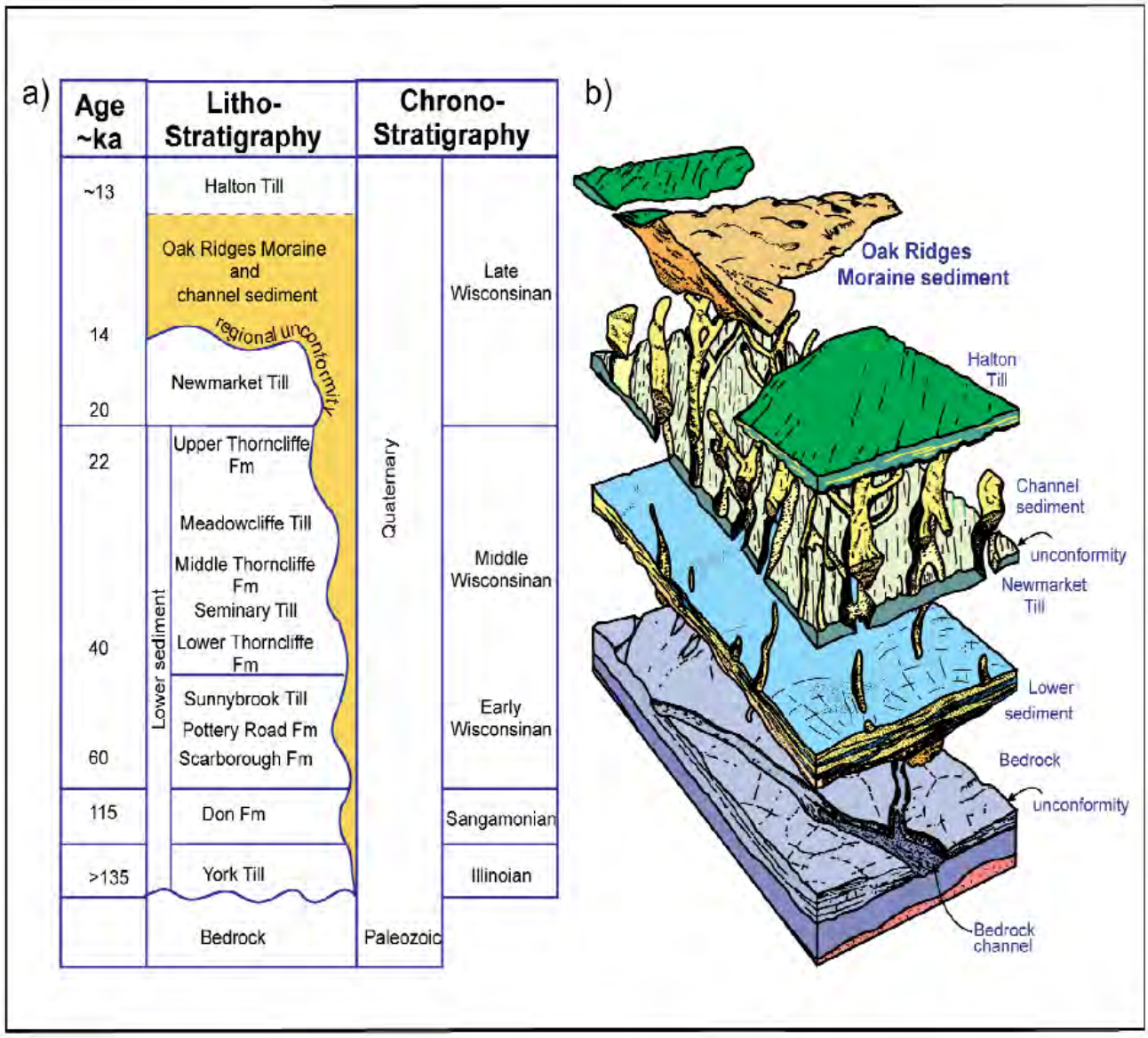
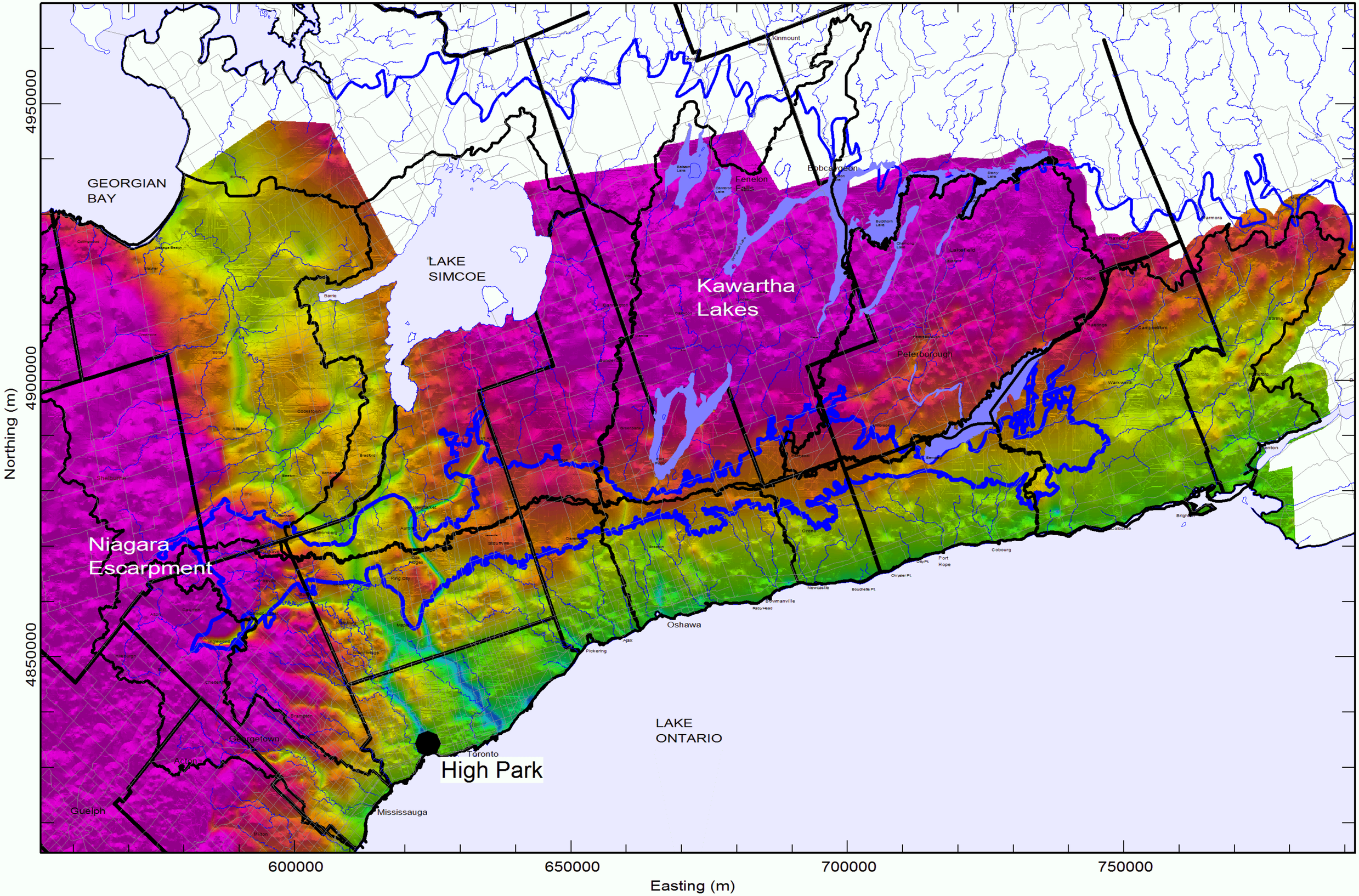
Figure 3: Conceptualized regional stratigraphy of the Oak Ridges Morain area.



(source: Geological Survery of Canada, 2013)



Legend

- CAMC/YPDT High Park
  Top of Bedrock (masl; ormv3-oct2007)

1 — 50 — 100 — 150 — 200 — 225

ORM Planning boundary

Municipal & CA boundary

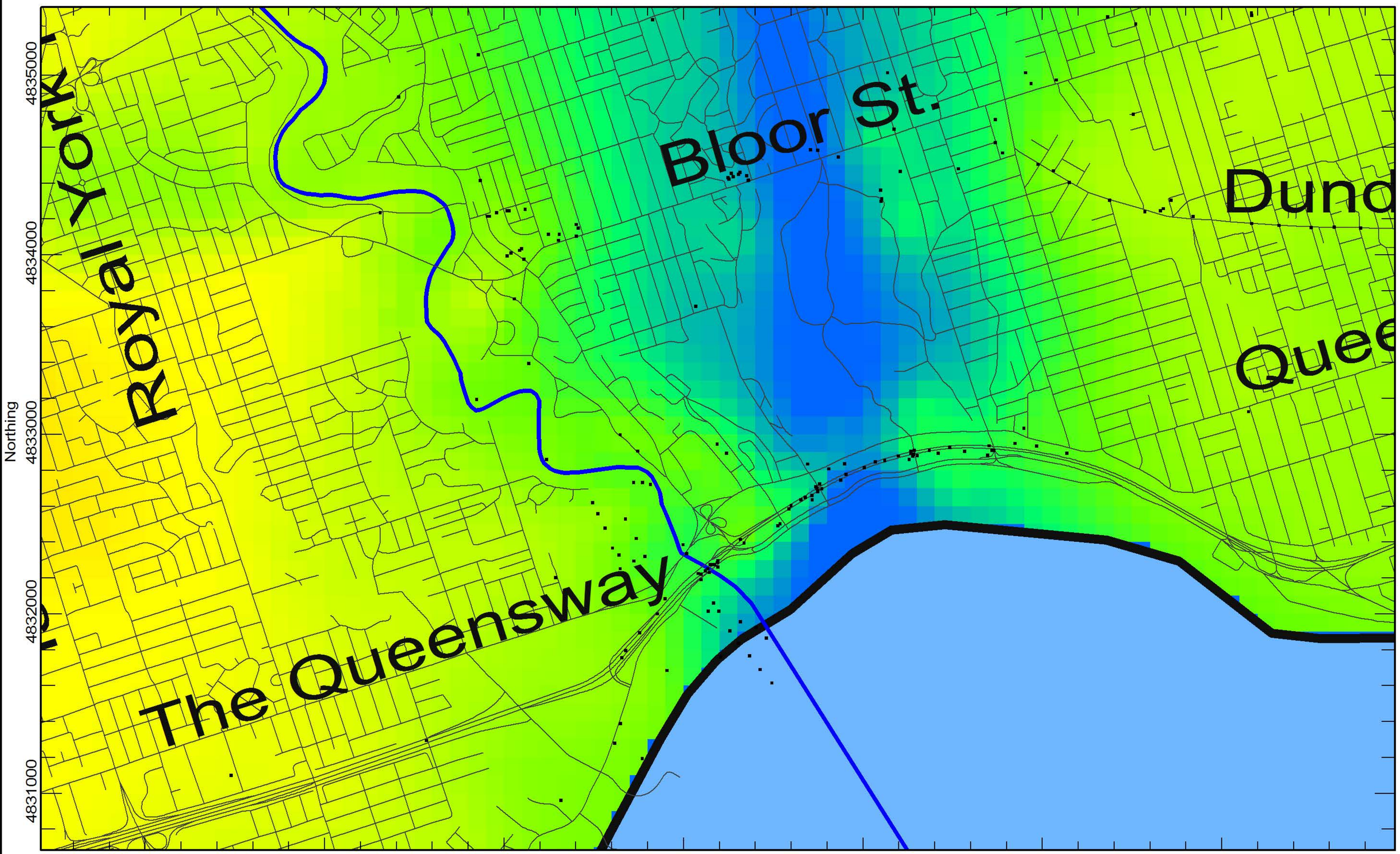
Map Scale in metres (1:986293)

0 20000 40000 60000

Projection: UTM NAD83 Zone17

Date (d/m/y): 01/04/2014

YPDT-CAMC - br topo (orm v3, oct2007)



Legend

■ BHs For Sections
Temp Top of Bedrock (masl)

0 50 100 150 200

Base Map Legend:

- Greenbelt Boundary
- Bedrock Valley Thalweg
- CA Boundary
- Cross Section

Data Sources:
- Ministry of Environment (C) Queens Printer for Ontario
- Region of York Geomatics Division
Projection: UTM NAD 83 Zone 17

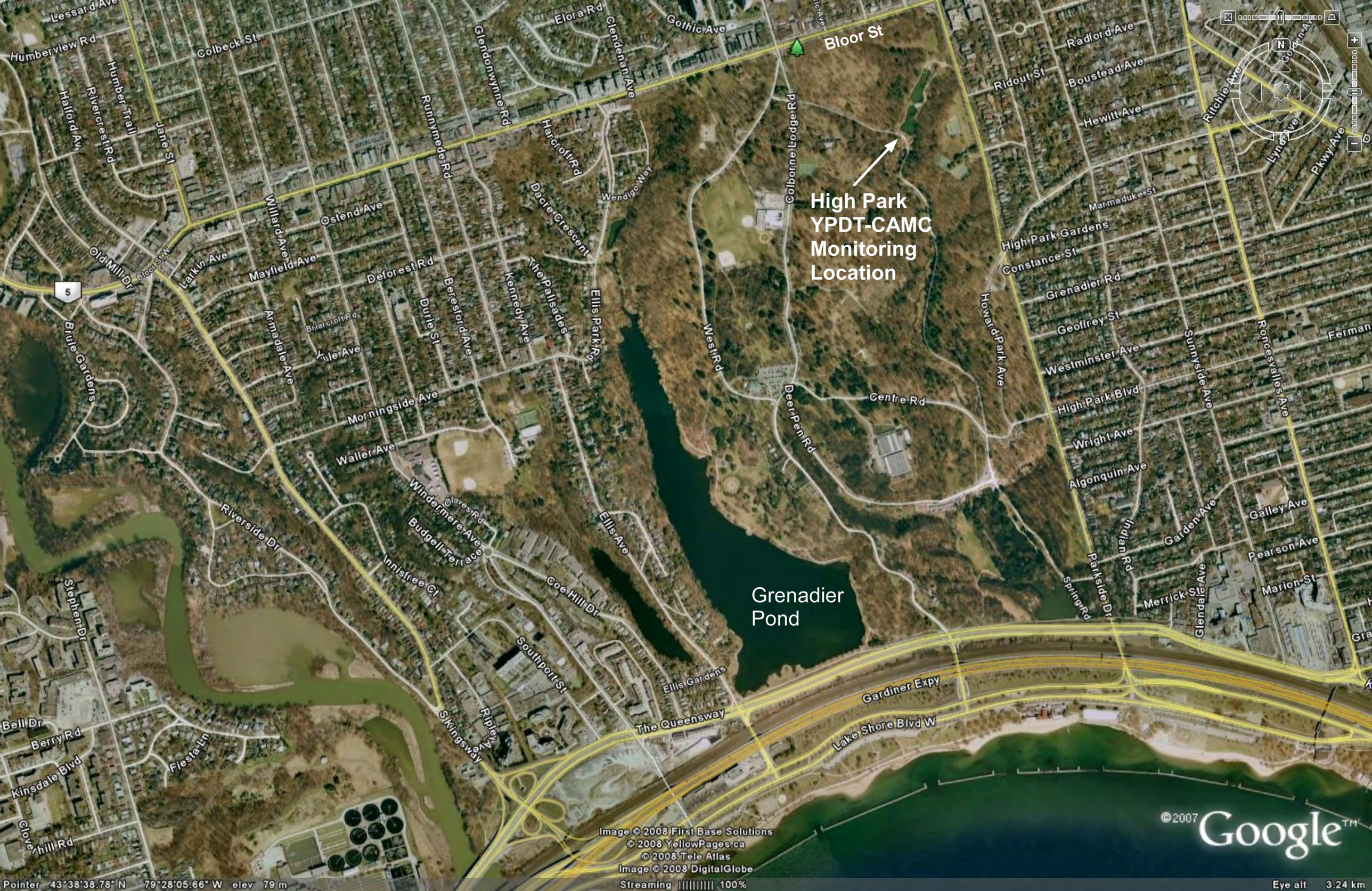
Scale: 1: 31599

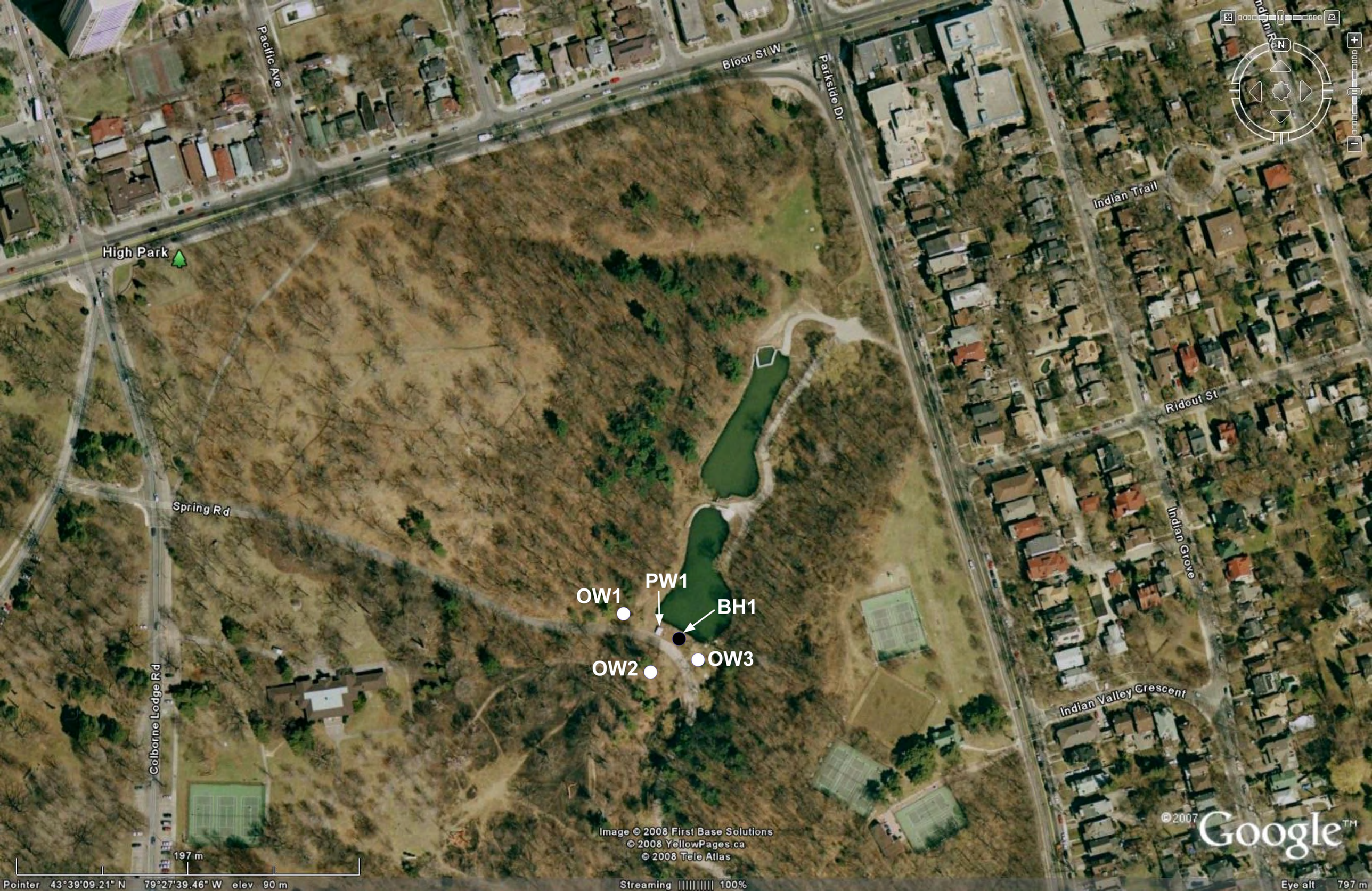
0 400 800

Oak Ridges Moraine GW Program (YPDT-CAMC) Date: 06/09/2017

Bloor St. W. - Toronto - Bedrock Surface

OakRidgesMoraine GROUNDWATER PROGRAM


High Park
YPDT-CAMC
Monitoring
Location
Grenadier
Pond
Bloor St
Lessard Ave
Humberview Rd
Colbeck St
Halford Ave
Rivercrest Rd
Humber Trail
Jane St
Runnymede Rd
Glendonwynne Rd
Elora Rd
Clendenan Ave
Gothic Ave
Harcroft Rd
Wendigo Way
Dacre Crescent
Colborne Lodge Rd
Ridout St
Radford Ave
Boustead Ave
Hewitt Ave
Ritchie Ave
Lynd Ave
Pkwy Ave
Marmaduke St
High Park Gardens
Constance St
Grenadier Rd
Geoffrey St
Westminster Ave
High Park Blvd
Wright Ave
Algonquin Ave
Indian Rd
Garden Ave
Galley Ave
Pearson Ave
Merrick St
Glendale Ave
Marion St
Parkside Dr
Spring Rd
Sunnyside Ave
Roncesvalles Ave
Howard Park Ave
West Rd
Deer Park Rd
Centre Rd
Ellis Park Rd
The Palisades
Kennedy Ave
Durie St
Beresford Ave
Armadale Ave
Briarcroft Rd
Yule Ave
Deforest Rd
Ostend Ave
Willard Ave
Mayfield Ave
Larkin Ave
Old Mill Dr
Bloor St W
Brule Gardens
Morningside Ave
Waller Ave
Windermere Ave
Clayes Rd
Budgell Terrace
Riverside Dr
Innistree Ct
Ellis Ave
Coe Hill Dr
Southport St
Ellis Gardens
Ripley Ave
Skingsway
The Queensway
Gardiner Expy
Lake Shore Blvd W
Stephen Dr
Bell Dr
Berry Rd
Kinsdale Blvd
Glovehill Rd
Fiesta Ln
5
Image © 2008 First Base Solutions
© 2008 YellowPages.ca
© 2008 Tele Atlas
Image © 2008 DigitalGlobe
Streaming 100%
©2007 Google™
Pointer 43°38'38.78" N 79°28'05.66" W elev 79 m
Eye alt 3.24 km


Pacific Ave
Bloor St W
Parkside Dr
Indian Trail
Ridout St
High Park
Spring Rd
Colborne Lodge Rd
Indian Grove
Indian Valley Crescent
PW1
OW1
BH1
OW3
OW2
Image © 2008 First Base Solutions
© 2008 YellowPages.ca
© 2008 Tele Atlas
© 2007 Google™
197 m
Pointer 43°39'09.21" N 79°27'39.46" W elev 90 m
Streaming 100%
Eye alt 797 m

Cross Section Along Bloor Street

West
(Royal York Rd)

S Kingsway

Parkside Dr

East
(Dufferin St)

Humber
River

High Park

TTC W3-1 (300.3)
TTC W3-6 (208.7)
TTC W3-12 (40.0)
TTC W2-5 (-18.4)
TTC W2-3 (24.6)
TTC W2-1 (23.7)
TTC W1-111 (75.7)
PGMN-32S (74.0)
TTC W1-105 (71.6)
TTC W1-109 (67.2)
High Park (-300.0)
TTC B3-15 (113.8)
TTC B3-17 (61.4)
TTC B3-7 (66.4)

Bedrock

Elevation (masl)

250
200
150
100
50

0
2000
4000
6000

Section Distance (m)

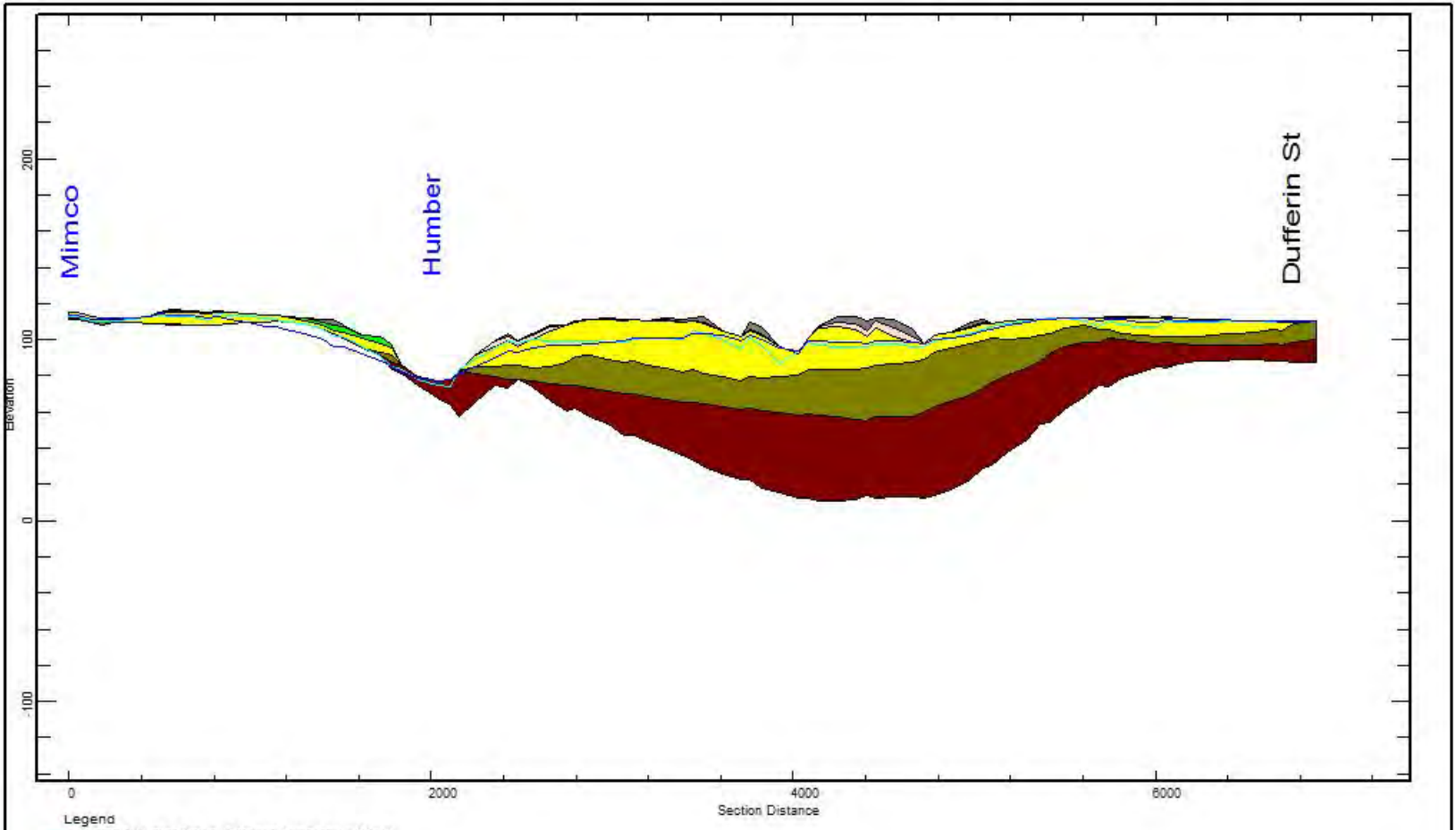
Legend:
- Recent deposits (v2 July 2006)
- Thorncliffe Fm & Lake Iroquois (v2 July 2006)
- Sunnybrook Drift (v2 July 2006)
- Scarborough Fm (v2 July 2006)
- Top of Bedrock (v2 July 2006), masl

Notes:
- vertical exaggeration: 15X
- section offset distance: 0m
- boreholes +/- 500m

Map Scale in metres

0 1000 2000

REG-High-Park-we-xs.map
Date (m/d/y): 27/03/2014



Legend
- Regional Water Table (Stream Corrected - 2015)
- Regional Potentiometric Surface (2015)
- Recent Deposit
- Halton Till
- ORC
- Top of ORAC Silt
- Bot of ORAC Silt
- Channel Silt
- Channel Sand
- Newmarket Till
- Int Newmarket
- Lower Newmarket
- Thorncliffe Fm
- Sunnybrook Drift
- Scarborough Fm

Map Scale (m)
0 400 800

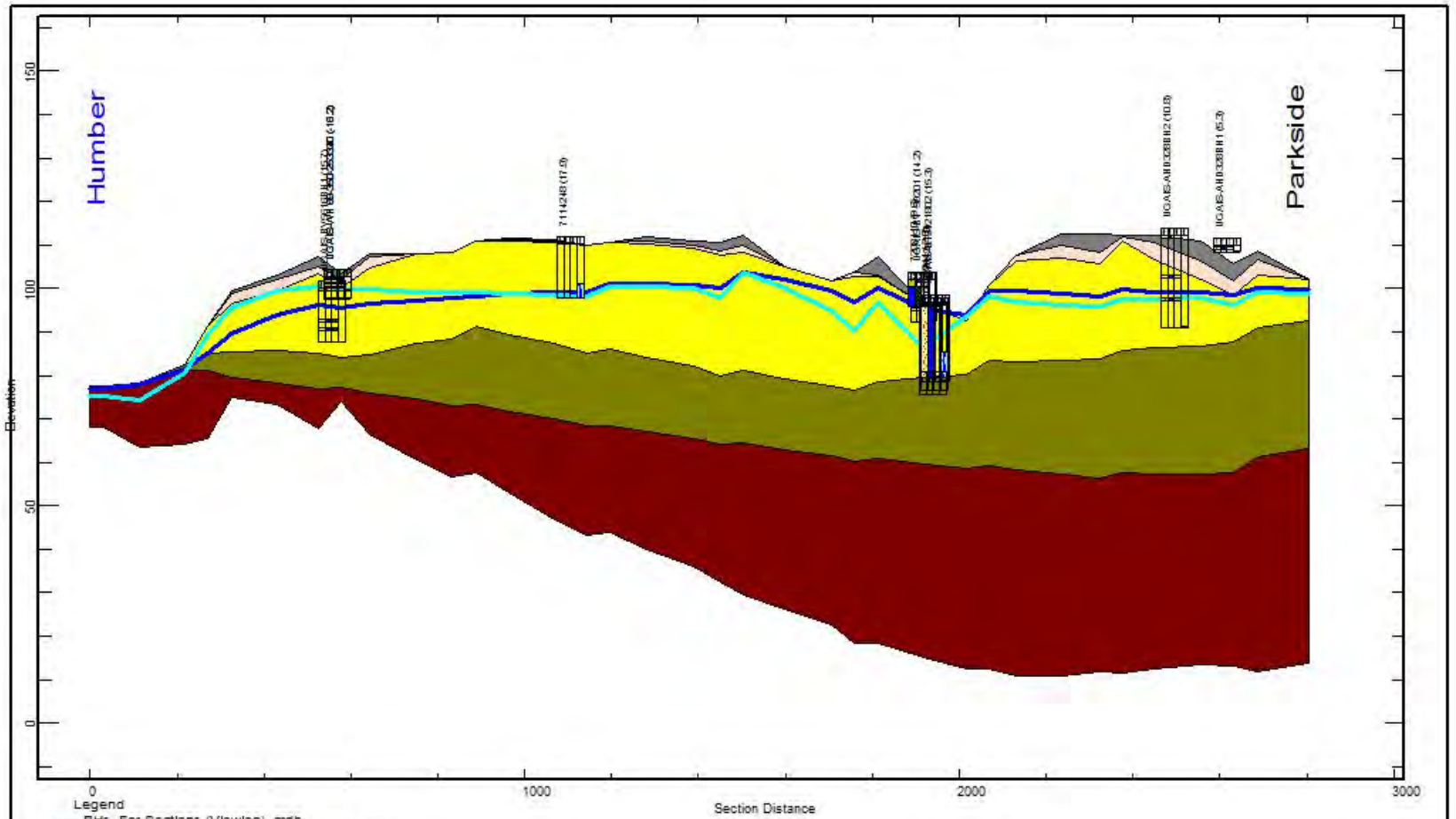
Vertical Exaggeration: 10

Date: 9/1/2017

West to East Cross Section Along Bloor West

Prepared by:
TRCA

Date:
Sept 1, 2017



Legend

- BHs_For Sections (Viewlog)_mdb
- Regional Water Table (Stream Corrected - 2015)
- Regional Potentiometric Surface (2015)
- Recent Deposit
- Halton Till
- ORC
- Top of ORAC Silt
- Bot of ORAC Silt
- Channel Silt
- Channel Sand
- Newmarket Till
- Int Newmarket
- Lower Newmarket
- thorncliffe Fm
- Sunnybrook Drift
- Scarborough Fm

Map Scale (m)
0 200 400

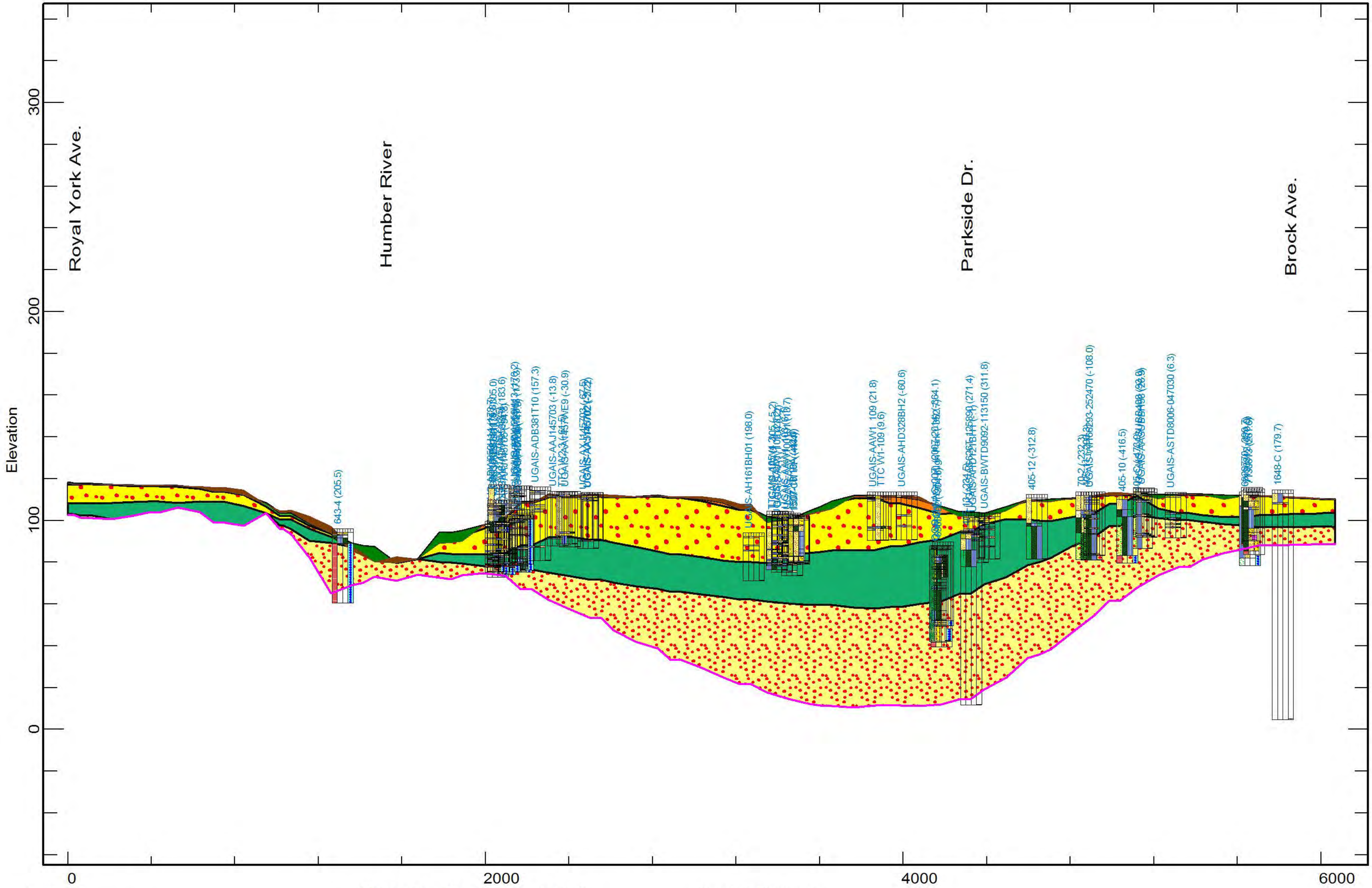
Vertical Exaggeration: 10

Date: 9/1/2017

West to East Cross-Section Along Bloor Ave W

Prepared by:
TRCA

Date:
Sept 1, 2017



Legend:
- BHs For Sections
- Late Stage
- Halton
- Oak Ridges
- Newmarket Till
- Thorncliffe
- Sunnybrook
- Scarborough
- Bedrock Surface (Master Grid)

Map Scale (in metres)

Section Distance

0 1000 2000

vertical exaggeration: 10X

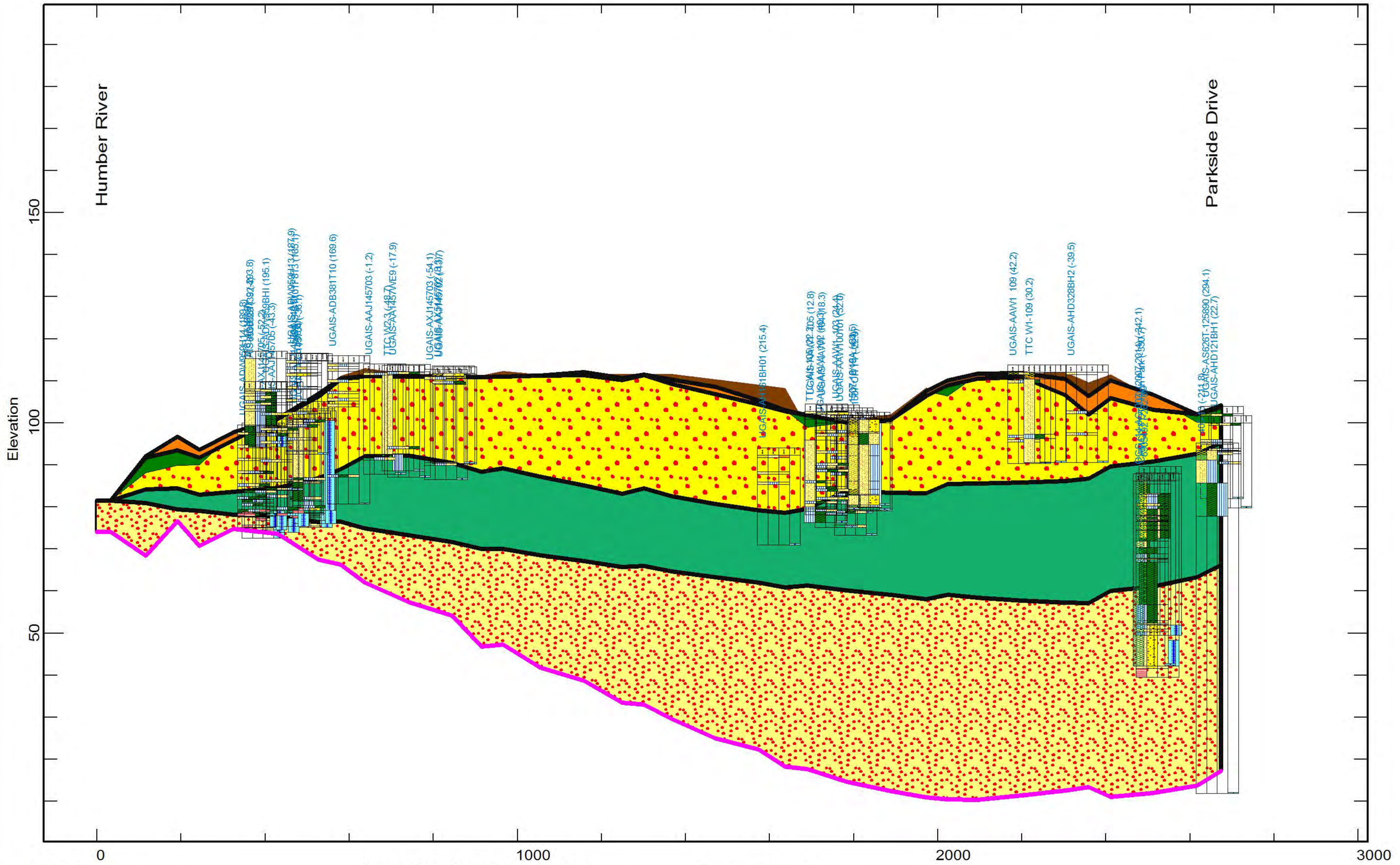
Notes:
- Projection: UTM NAD83 Zone 17
- All elevations in metres above sea level

Borehole Offset distance - 200 m
- Date: 06/09/2017

Oak Ridges Moraine GW Program (YPDT-CAM

W-E Section - Bloor St. (Royal York to Brock Av

OakRidgesMoraine GROUNDWATER PROGRAM



Legend:

- BHs For Sections
- Late Stage
- Halton
- Oak Ridges
- Newmarket Till
- Thorncliffe
- Sunnybrook
- Scarborough
- Bedrock Surface (Master Grid)

Map Scale (in metres)

Section Distance

0 400 800

vertical exaggeration: 10X

Notes:

- Projection: UTM NAD83 Zone 17
- All elevations in metres above sea level

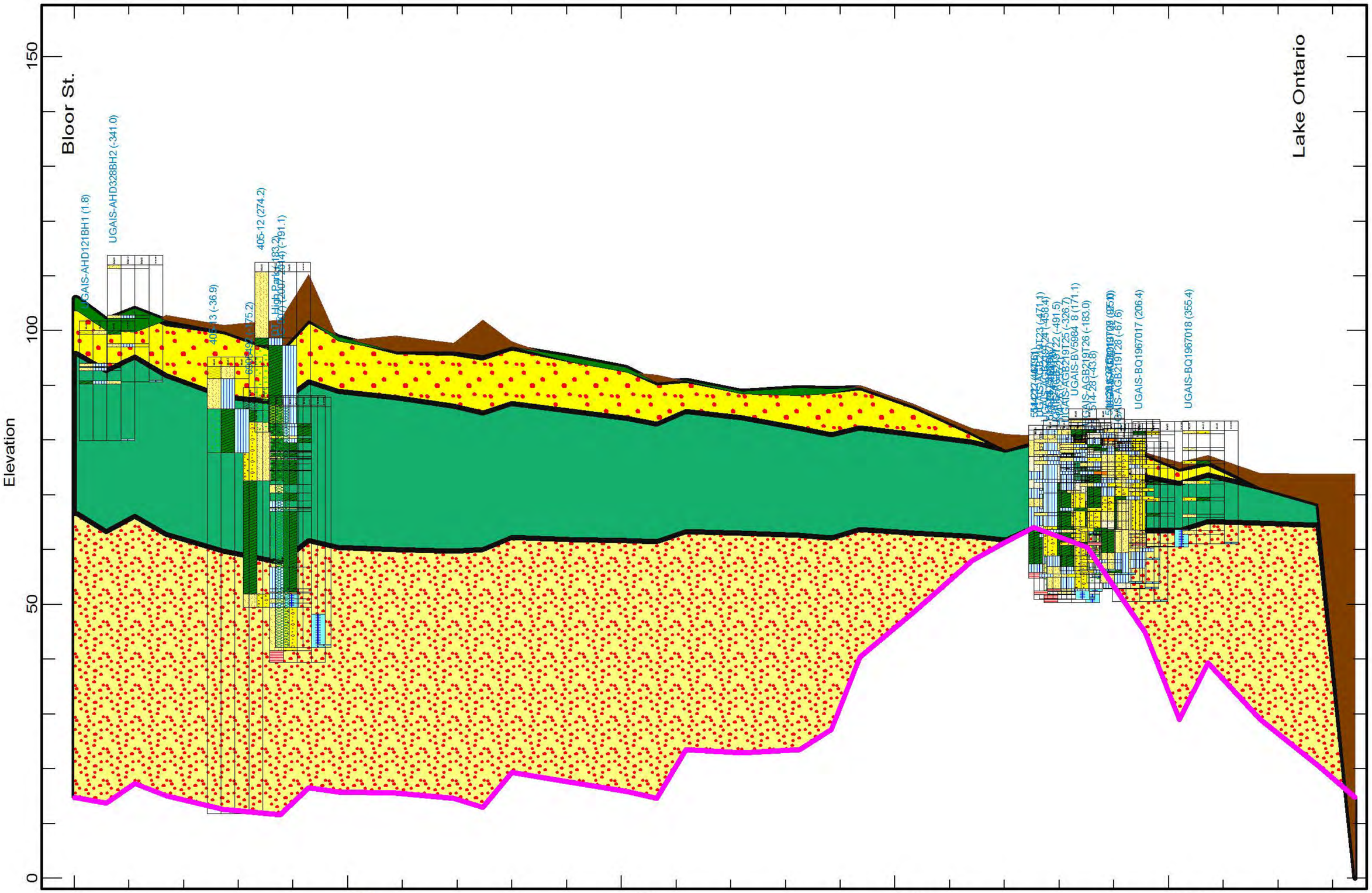
Borehole Offset distance - 200 m

- Date: 06/09/2017

Oak Ridges Moraine GW Program (YPDT-CAMC

W-E Section - Bloor St. (Humber R. to Parkside D

OakRidgesMoraine GROUNDWATER PROGRAM



Legend:
- BHs For Sections
- Late Stage
- Halton
- Oak Ridges
- Newmarket Till
- Thorncliffe
- Sunnybrook
- Scarborough
- Bedrock Surface (Master Grid)

Map Scale (in metres)

0 400 800

vertical exaggeration: 10X

Notes:
- Projection: UTM NAD83 Zone 17
- All elevations in metres above sea level

Borehole Offset distance - 200 m
- Date: 06/09/2017

Oak Ridges Moraine GW Program (YPDT-CAMC

N-S Section - Parkside Dr. (Bloor to Lake Ont

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