

**HYDROGEOLOGICAL ASSESSMENT
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT
HUNTINGTON ROAD IMPROVEMENTS
PARTS A AND B
VAUGHAN, ONTARIO**

Prepared for:

City of Vaughan

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1.0 INTRODUCTION

Parsons Inc. (Parsons) has completed this hydrogeologic assessment in support of the Municipal Class Environmental Assessment (EA) for the proposed improvements of Huntington Road Part A from Langstaff Road to McGillivray Road and Part B from Major Mackenzie Drive to Nashville Road.

Hydrogeological conditions were reviewed for the Study Area described herein (see Section 2.0). This review involved: (1) an evaluation of soil and bedrock rock geology and stratigraphy within the Study Area from publically available sources and available reports; (2) a review of water wells records for the Study Area and beyond; (3) a site reconnaissance; and (4) an evaluation of potential risks posed to the quality and quantity the groundwater resource in the Study Area due to the improvements for Huntington Road. The hydrogeologic assessment also considered the potential to encounter soil and/or groundwater contamination during construction and roadwork, and potential adverse effects to adjacent private water supply wells (private wells), wetlands and watercourses sensitive to changes to groundwater. The potential for contamination of groundwater takings potentially required for construction dewatering was also considered.

The information reviewed and presented under this hydrogeologic assessment was assembled by Brian Thiemer, M.Sc., P.Geo. The author of this report, John Halstead, M.Sc., P.Geo., utilized that information to prepare this hydrogeologic assessment in support of the Municipal Class EA.

2.0 DESCRIPTION OF STUDY AREA

The Study Area includes an approximately 6 km long section of Huntington Road and lands within approximately 500 m east and west of Huntington Road, and 500 m north and south of intersections of Nashville and Langstaff Roads with Huntington Road. Figure 1 shows the location of Huntington Road and Part A and Part B portions, and Figure 2 the Study Area.

2.1 LAND USE

Land use in the Study Area includes a mixture of undeveloped woodlots and grassland, agricultural, residential, and commercial. Huntington Road is currently a two lane road that has paved and unpaved gravel portions. Residential land use consists of houses on large rural lots along Huntington Road, a line of houses on medium sized lots distributed along Nashville Road and east of Huntington Road, and a high density suburban subdivision that was being constructed on lands northeast of Major Mackenzie Drive and Huntington Road. An electricity transmission corridor right-of-way owned by Hydro One crosses north of Rutherford Road. The CP Vaughan Intermodal Terminal is a railway yard located west of Huntington Road between Rutherford Road and Major Mackenzie Drive. Large flat-roofed commercial buildings are present, or are in the process of construction, west of Huntington Road and at the Trade Valley Drive subdivision. A railway line crosses Huntington Road south of Major Mackenzie Drive. A cemetery is located 700 m south of Nashville road, along the east side of Huntington Road.

2.2 TOPOGRAPHY AND GEOLOGY

According to Energy, Mines and Resources Canada topographic map 30 M/14 (Markham, Ontario), the Study Area is relatively flat. Regionally the topography slopes down in a southeasterly direction (i.e., towards Lake Ontario), which is also the direction of regional surface water drainage patterns. The maximum elevation along Huntington Road is approximately 218.5 m above sea level (ASL) at a location north of Nashville Road and the minimum elevation is approximately 191 m ASL at a location south of Langstaff Road.

According to Ministry of Northern Development and Mines Map 2556 Quaternary Geology Map of Ontario, Southern Sheet (see Figure 3), surface soils in the Study Area are as follows:

- Predominantly glaciolacustrine silt and clay deposits with minor sand (light brown no. 24 area on Figure 3); and
- At the very northern limit of the Study Area, a deposit of glaciolacustrine sand (purple area no. 25 on Figure 3).

Beyond the lacustrine deposits is the Halton Till (pink no. 17 area on Figure 3), which is a predominantly silt or silty clay matrix rich till (i.e., clast/gravel poor). The Halton Till would be expected to extend beneath the lacustrine deposits described above. The water well records, discussed in Section 3.0, typically identify clay deposits starting at, or very near, the ground surface that extend to relatively deep depths (i.e., deeper than needs be considered for this EA). The silt and clay glaciolacustrine deposits and Halton Till dominate the Study Area and will be naturally protective of deeper potable groundwater aquifers that are being used for private and public potable water supplies locally and regionally. There does not appear to be a regional aquifer within approximately 30 m of ground surface in the Study Area and beyond.

Soil-Eng Limited (2001) completed a soil investigation of a proposed residential subdivision in 2001 on behalf of 1446258 Ontario Inc. The investigation was completed in the area north of Nashville Road and East of Huntington Road in relation to a proposed "16 Lot Estate Residential Subdivision". Three boreholes were advanced to a depths of 5.0 m below ground surface (mbgs) using an auger drill rig equipped for split spoon sampling. The stratigraphy encountered in the boreholes, with increasing depth, consisted of fill in some places, sandy silt, silty fine sand and coarse sand, overlying a silty clay till that extended to the depth of the investigation. The maximum depth to the base of the fill was 1.2 mbgs. Some groundwater seeped into all three boreholes at shallow depths (i.e., at 1.3 m or less) and soil colour changed from brown to grey at 2.9 mbgs or 4.2 mbgs. This colour transition typically marks the lowest seasonal elevation of the groundwater table, therefore, the water table in the area will typically be encountered at relatively shallow depths (i.e., within about the upper 3 m of soil profile). Bedrock was not encountered during the investigation.

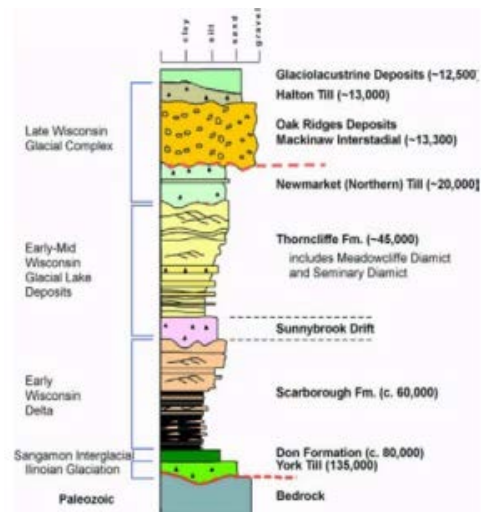
AMEC Earth & Environmental (2004) was retained by Totten and Sims Hubicki and Associates to undertake a geotechnical investigation along Huntington Road over the portion of Part A and Part B in 2004. A total of 35 boreholes were advanced to depths ranging from 1.5 mbgs to 3.7 mbgs.

Fill materials were encountered in the boreholes extending to depths ranging from 0.4 mbgs to 2.4 mbgs. The fill materials were underlain by native soils, specifically “clayey silt/silty clay, clayey silt/silty clay till, and/or silty sand/sand”. Groundwater was not observed in the open boreholes except for two, where groundwater levels were measured at 1.6 mbgs and 1.4 mbgs.

The above reports generally confirm the information obtained from Map 2556 and water well records (see Section 3.0), specifically that beneath any shallow fill soils predominantly silt and clay native soils would be expected during Huntington Road Part A widening and Part B improvements.

According to Ministry of Northern Development and Mines Map 2544 Bedrock Geology of Ontario, Southern Sheet, the City of Vaughan is underlain by Paleozoic bedrock of Upper Ordovician age, specifically the Georgian Bay Formation that is comprised of shale, limestone dolostone and siltstone, but is generally considered a shale formation. Given the thickness of soil cover in the Study Area, the proposed improvements to Huntington Road will not encounter or affect the bedrock, therefore, no additional hydrogeologic assessment is required in relation to bedrock. Water well records indicate that bedrock, where encountered, occurs at depths ranging from 18 mbgs to 89 mbgs and the deepest borehole that did not encounter bedrock was to 79 mbgs (i.e., no. 6929986).

Azimuth Environmental Consulting (2013) completed a hydrogeologic assessment for a Municipal Class Environmental Assessment related to a proposed West Vaughan Sewage Servicing project. The report provides additional information regarding the stratigraphy of the current Study Area under this hydrogeologic assessment. Specifically, Graphic 1 in the Azimuth report depicts deeper geologic formations that exist between the Halton Till and the Paleozoic bedrock (i.e., the Georgian Bay formation), which are comprised of coarser sand and gravel aquifers and, therefore, tend to be utilized for both public and private water wells.



Graphic 1: Stratigraphic Profile of the Oak Ridges Moraine (modified from Gerber 1999)

2.3 SURFACE WATER AND WETLANDS

Regionally, the Study Area lies within the Rainbow Creek sub-catchment within the Humber River watershed. Within the Study Area, seven watercourses cross Huntington Road, one crosses Rutherford Road, two cross Major Mackenzie Drive and one crosses Nashville Road. The watercourses tend to flow east and southeast on the west side of Huntington Road, then divert south and southeastward east of the road. Some watercourses flow perennially and others are intermittent. A few isolated ponds and ponds along watercourses occur scattered throughout the Study Area.

The Study Area includes approximately nine wetlands as mapped by the Ministry of Natural Resources and Forestry. These wetlands are unevaluated with respect to Provincially Significant

Wetland classification. A relatively larger wetland is located on a woodlot block that spans southwest of the Huntington-Nashville Roads intersection. It is probable that local wetlands will have the shallowest water table.

3.0 HYDROGEOLOGY AND POTABLE GROUNDWATER SUPPLY

Drinking water in the area is obtained by private wells and by municipal services. A water main extends from Nashville Road in the portion east of Huntington Road, along Roe Road west of Huntington, and along Huntington Road from Nashville Road to Rutherford. In these areas properties are likely connected to these municipal supplies. Residences along Huntington Road appear to rely on rural servicing (i.e., private wells and septic fields) because no water main was identified on Huntington road. Given their large scale and proximity to Highway 50, it is probable that the commercial buildings in the Trade Valley Road area and the southern portion of Huntington Road receive municipal water and sewer services, but specific information was unavailable to confirm this.

A search of the Ontario MOECC's water wells database for the area returned over 250 water supply wells and boreholes for geotechnical investigations within the Study Area and beyond. The listings likely include active supply wells and historic water wells that are now destroyed or abandoned. Analysis of recent aerial photography indicates that the number of occupied rural properties that potentially have private wells in the Study Area is 38. Water wells returned from the MOECC database within and beyond the Study Area are shown on Figure 4.

In 2014 Parsons conducted a water well survey that utilized mailing since local occupied properties receive letters at a local post office. Door-to-door surveying was limited to only several properties. The survey consisted of a package that included an introductory letter and a questionnaire about well conditions and water quality, along with a mail-back envelope. These packages were mailed to occupied properties where rural servicing was considered a possibility. The mail-out distribution did not include Nashville Road addresses that are interpreted to be provided with municipal servicing, residential subdivisions and commercial land uses. Note that the author of this report could find no returned completed questionnaires on file related to either the mailed or door-to-door surveys; however, this is not considered an issue given the geology of the Study Area and nature of the proposed improvements to Huntington Road Part A and B, the quantity and quality of groundwater from the deeper aquifers is unlikely to be affected. The rationale being that potable groundwater in the area is typically pumped from aquifers below the fine grained glacial lacustrine deposits and Halton Till on which the proposed works will take place and that are protective of the deeper regional aquifers.

Municipal supply wells (TRSPA, Chapter 4, 2012) designated as Kleinburg Well Nos. 3 and 4, are located off Whisper Lane that is approximately 920 m east of Huntington Road. Concentric wellhead protection areas for these municipal wells, including the 5 year to 10 year travel time zone and the 10 year to 25 year travel time zone span the northern portion of Huntington Road. The 2 to 5 year travel time zone boundary is bounded by Huntington Road. The area near Nashville Road has medium and low intrinsic vulnerability scoring in Source Protection mapping. These wells reportedly draw groundwater from the deep Scarborough Formation aquifer.

Water table information at shallow depths was generally not available; however, the water table tends to mimic the overlying ground surface topography and will come to surface where it intersects with surface water bodies. Groundwater flow in the Study Area is expected to be toward the east and southeast regionally, with localized flow towards watercourses. The shallowest water table is anticipated to occur at or near to wetlands and watercourses. Based on the borehole logs from the previously discussed Soil-Eng report, the brown to gray clay transition most likely indicates the approximate lowest elevation of the water table (i.e., the brown to gray clay transition tends to mark the location of the boundary between the unsaturated (vadose) zone where oxidation occurs and saturated zone where it does not). Similar observations are evident in the water well records that also include transitions from brown to blue clay, leading to the same conclusion. These transitions generally occur at shallow depths, below which the saturated blue and gray clays will not exhibit fracturing and desiccation (i.e., will not develop enhanced secondary porosity that increases permeability).

In summary, the proposed improvements to Huntington Road Part A and B is not anticipated to affect either the quantity or the quality of groundwater resources in the Study Area of this hydrogeologic assessment. Available information indicates the proposed work will be completed in the low permeable fine grained glaciolacustrine deposits and the similarly textured underlying Halton Till that are aquitards and generally unsuitable for water supply and protective of deep aquifers. Further, the seasonally deepest groundwater table is evidently also shallow, and within these fine textured formations, thereby preventing the formation of secondary porosity that would increase the permeability from the low norms expected for these fine-grained formations. There was no evidence of perched aquifers in the Study Area.

4.0 ASSESSMENT OF CONTAMINATION AND DEWATERING

The native lacustrine soils in the area and Halton Till are both predominantly fine textured geologic formations that will not likely yield significant groundwater during excavation that would require dewatering. However, the water table in the area is relatively shallow all year and the widening work may intersect some shallow and coarse grained fill soils locally that might require some dewatering; however, this would not likely require a sustained (i.e., continuous pumping) effort. It is unlikely that the volumes of groundwater required to dewater would require a Permit-to-Take-Water (PTTW) from the Ministry of the Environment and Climate Change (MOECC) and, if dewatering is required it could be using the new MOECC Environmental Activity and Sector Registry approval process.

Groundwater contamination is not expected to be of significant concern within the Study Area. The most significant potential contaminant source is the CP Vaughan Intermodal Terminal where numerous railway containers are present and where maintenance activities are likely occurring. If dewatering and discharge to the environment is required in proximity and downgradient of the Terminal, then analysis should be for a wide range of potential contaminants. There is also a relatively lower potential for contaminants in association with trucks and industrial activity visible at 9667 Huntington Road (Tedescon Infrastructure Ld. Environmental). Site conditions are unknown for both properties.

Construction dewatering is more likely to be required where deep excavations occur that intersect the shallow water table in variable textures and, therefore, potentially more permeable fill soils. The shallowest water table conditions are more probable in relatively low areas, close to wetlands and at watercourse crossings. Additional subsurface investigation could be completed to better evaluate the need and extent of dewatering. Dewatering is considered more likely in Part B to the north, within 900 m south of Nashville Road due to the coarser soils.

5.0 RECONNAISSANCE VISIT

A reconnaissance visit to the area was completed and the author of this hydrogeologic reviewed various photographs from that visit. In summary, other than confirming the topography and the presence of private water wells in the area, the reconnaissance provided no additional information to be included in this hydrogeologic assessment.

6.0 CONTACTING GOVERNMENT AGENCIES

Parsons contacted various government agencies regarding available hydrogeological information in the Study Area. The results are summarized below.

- The Ministry of Natural Resources provided no information.
- The City of Vaughan did not provide specific information and referred to a Highway 427 Transportation Corridor EA that would have information for the Study Area, but this document was not reviewed as information reviewed from other sources was deemed sufficient to support the hydrogeological assessment under the Municipal Class EA.
- The MOECC provided no information other than from the water well record database as discussed under Section 3.0.
- The Region of York did not provide any information with the exception of the following references:
 - Kleinburg-Nashville Water and Wastewater Servicing Strategy Master Plan 2012, by AECOM for the City of Vaughn;
 - Class Environmental Assessment, Water Supply and Storage Capacity for Kleinburg-Nashville 2007, by KMK Consultants Limited for York Region; and
 - Class Environmental Assessment, Waste Water Servicing for Kleinburg-Nashville 2007, by KMK Consultants Limited for York Region.

The above documents were not reviewed because information reviewed from other sources was deemed sufficient to support the hydrogeological assessment under the Municipal Class EA.

7.0 REFERENCES

1. Soil-Eng Limited. March 2001. A Report to 1446258 Ontario Inc., A Soil Investigation for Proposed Residential Subdivision, North of Nashville Road, East of Huntington Road, City Vaughan
2. AMEC. April 29, 2004. Geotechnical Investigation Report, Road Rehabilitation, Huntington Road from Langstaff Road to Kirby Road, Vaughan, Ontario
3. Azimuth Environmental Consulting Inc. Hydrogeologic Assessment. June 2013, Municipal Class Environmental Assessment, West Vaughan Sewage Servicing
4. Updated Report: Toronto and Region Source Protection Plan, Assessing Vulnerability of Drinking Water Sources. January 28, 2012

8.0 CLOSURE

We trust the foregoing information is satisfactory for your requirements.

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