BURNSIDE

Farewell Heights Secondary Plan Existing Conditions Hydrogeology Report

Municipality of Clarington

Farewell Heights Secondary Plan Existing Conditions Hydrogeology Report

Municipality of Clarington

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

November 2024
300056758.2000

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0	Yes	Yes	Mustafa Ghassan, Delta Urban

Record of Revisions

Revision	Date	Description
-	August 8, 2024	Draft Submission to the Municipality of Clarington
0	November 19, 2024	Final Submission to the Municipality of Clarington

R.J. Burnside & Associates Limited

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DS:cl

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Hydrogeologist

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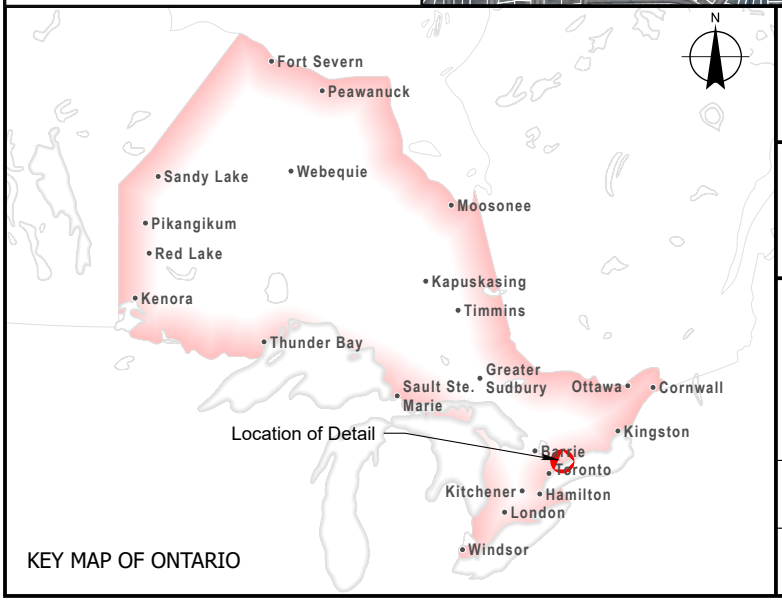
1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) has been retained by the Farewell Heights Landowners Group on behalf of the Municipality of Clarington to prepare a hydrogeological assessment in support of the Farewell Heights Secondary Plan being led by the Municipality of Clarington. The Farewell Heights Secondary Plan Area (study area) is located in north Courtice and is approximately 107 ha in size and is located generally east of Tooley Road, south of Pebblestone Road, west of Courtice Road and north of Adelaide Avenue and its proposed extension. The location of the study area is illustrated in Figure 1.

The purpose of the hydrogeological study is to characterize the hydrogeological conditions in the study area and evaluate the potential impacts of development on groundwater and surface water quality and recommend mitigation measures to limit impacts.



KEY MAP OF ONTARIO

BURNSIDE

TRUSTEE: FAREWELL HEIGHTS LANDOWNERS GROUP
FOR: MUNICIPALITY OF CLARINGTON

Map Title

SITE LOCATION

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2.0 Scope of Work

The study area is located within the Farewell Creek catchment and watercourses within the study area generally drain towards Farewell Creek. The scope of work for the hydrogeological assessment was designed to address the requirements for hydrogeological studies completed in support of development applications. Specifically, the hydrogeological work program was completed to:

- Review the regional hydrogeological setting.
- Characterize the local soil, groundwater, and surface water flow conditions.
- Assess the local groundwater/surface water interactions and identify areas for recharge/discharge function protection.
- Characterize the existing groundwater quality.
- Calculate the pre- and post-development groundwater balance conditions.
- Identify hydrogeological opportunities and constraints to maintaining the groundwater balance.
- Identify potential construction constraints related to hydrogeological conditions.

The detailed scope of work included:

1. Review of Ministry of the Environment Conservation and Parks (MECP) water supply well records for the study area as an aid to assess the regional hydrogeological setting and soil conditions. A listing of the MECP water supply well records for the area is provided in Appendix A.

2. Review of the Oak Ridges Moraine Groundwater Program (ORMGP) online groundwater management portal. The ORMGP portal is a data management portal that houses information on hydrogeology and groundwater resources across much of southern Ontario. The portal contains data as well as geological interpretations that support groundwater analysis and was consulted extensively through this study.

3. The installation of a network of boreholes, groundwater observation wells, and shallow drive-point piezometers to investigate the site-specific soil and groundwater conditions. Available geotechnical and observation well records from boreholes completed in the study area are provided in Appendix B.

4. Single well response testing of four groundwater observation wells to estimate in situ hydraulic conductivity of the geological units. The field-testing results are included in Appendix C.

5. Monitoring of groundwater levels to measure the depth to the water table, seasonal groundwater table variations and assessing the horizontal and vertical

groundwater flow conditions. Four seasons (12 months) of monitoring is proposed and the data to be compiled will be provided at a later date.

6. Monitoring of surface water flow for this study will be completed at a similar frequency as the groundwater monitoring outlined above. Surface water monitoring will be conducted to examine the relationship between groundwater discharge and surface water flows.

7. Water samples will be collected from two observation wells and two surface water locations to characterize the background water quality of the study area. The water samples will be submitted to an accredited laboratory for analyses of general quality indicators (e.g., pH, hardness, conductivity), basic ions (including chloride and nitrate) and selected metals.

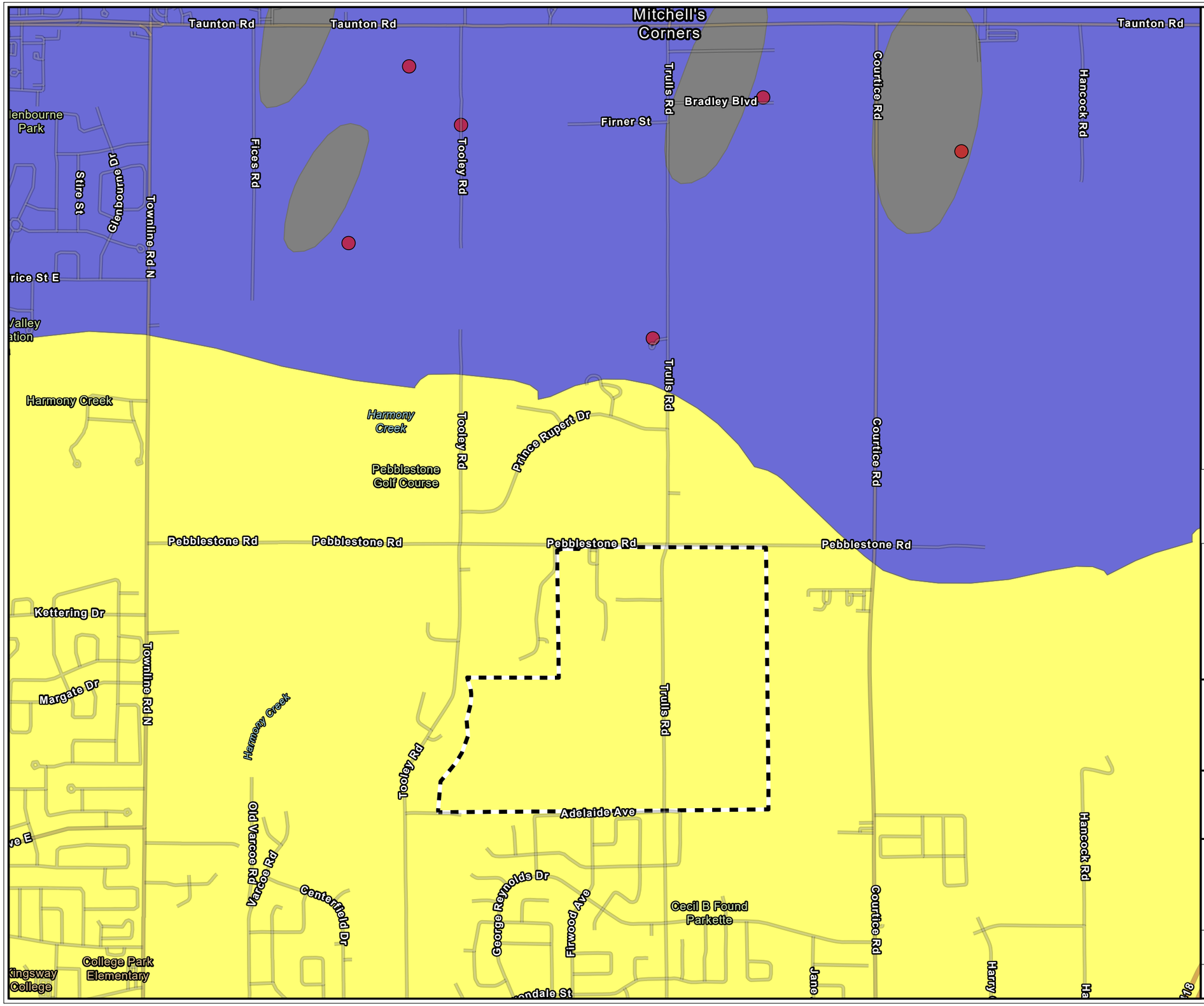
8. Analysis of all compiled data will be undertaken to characterize the hydrogeology of the study area and make interpretations of the potential impacts of development on the hydrogeological regime. Mitigation measures and recommendations to reduce impacts will be presented in a final report.

3.0 Physiography and Topography

The study area is located within the Iroquois Plain physiographic region which is south of the South Slope of the Oak Ridges Moraine (Figure 2). The Iroquois Plain is the area of lowland bordering Lake Ontario that was previously the bed of Lake Iroquois. The sediments of the lakebed were smoothed by wave action or lacustrine deposits and stand in contrast to the undulating till plains that stood above the water line. The plain is a mosaic of till plains, drumlins and areas of silty lacustrine sediments (Chapman and Putnam 1984). The study area drains southward towards Lake Ontario with the highest elevations in the northeast and dropping towards the southwest. Analysis of the detailed topography indicates that the highest elevations, up to 148 masl (metres above mean sea level) are found at the northeast boundary of the study area (Figure 3). There is a relief of about 14 m across the study area, with the lowest elevations (134 masl) found near the southeastern boundary of the study area at Adelaide Avenue.

3.1 Drainage

The study area is part of the catchment for Farewell Creek which rises to the north of the study area within the Oak Ridges Moraine and flows southwest outside the west edge of the study area. Tributaries of Farewell Creek arise within the study area, both east and west of Trulls Road and flow in a southwest direction to eventually join Farewell Creek (Figure 3). The study area also features several lobes and pockets of the Harmony-Farewell Iroquois Beach Provincially Significant Wetland (PSW).



SECONDARY PLAN AREA

DRUMLIN

PHYSIOGRAPHY UNIT (MNDM)

7,DRUMLINS

PHYSIOGRAPHIC REGION (MNDMF)

IROQUOIS PLAIN

SOUTH SLOPE

Sources:

1. Ministry of Natural Resources and Forestry,© King's Printer for Ontario.
2. Natural Resources Canada,© His Majesty the King in Right of Canada.
3.Chapman, L.J. and Putnam, D.F. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 228.

Datum: North American 1983 CSRS

Coord. System: NAD 1983 CSRS UTM Zone 17N

0 100 200 300 400 500 600 700

Meters

N

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TRUSTEE: FAREWELL HEIGHTS LANDOWNERS GROUP
FOR: MUNICIPALITY OF CLARINGTON

Figure Title

FAREWELL HEIGHTS SECONDARY PLAN
EXISTING CONDITIONS HYDROGEOLOGY REPORT

PHYSIOGRAPHIC REGIONS

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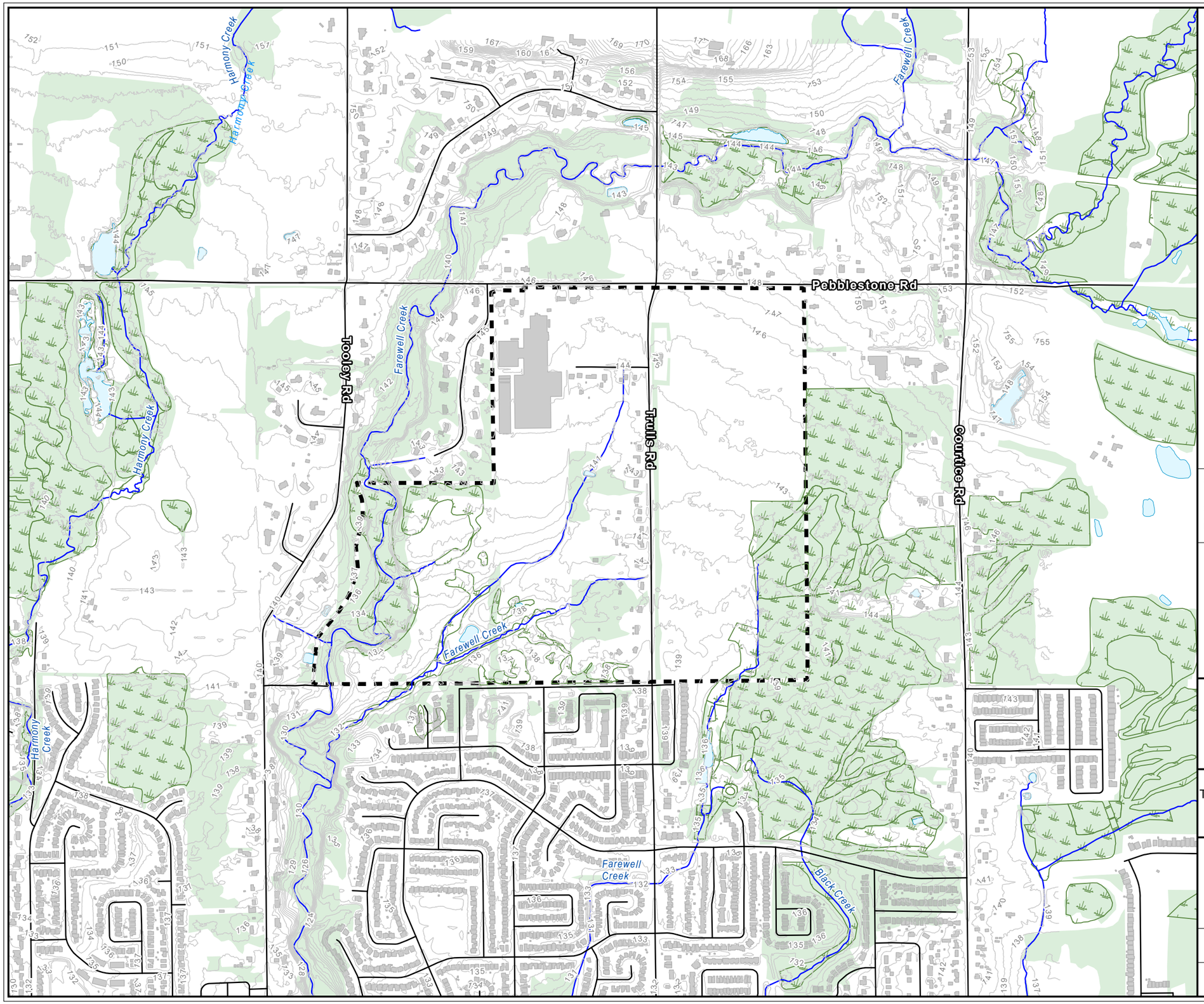

SECONDARY PLAN AREA
WATERCOURSE
WATERBODY
WETLAND (MNRF, 2021)
CONTOUR 1M (NRCAN)
WOODED AREA
ROADWAY

Sources:

1. Ministry of Natural Resources and Forestry,© King's Printer for Ontario.
2. Natural Resources Canada,© His Majesty the King in Right of Canada.
3. Ontario Geological Survey 2010. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 128 – Revised.

Datum: North American 1983 CSRS

Coord. System: NAD 1983 CSRS UTM Zone 17N

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Meters

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Figure Title

FAREWELL HEIGHTS SECONDARY PLAN
EXISTING CONDITIONS HYDROGEOLOGY REPORT

TOPOGRAPHY AND DRAINAGE

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4.0 Climate

Climate data for the study area was reported based on the Oshawa WPCP Climate Station that is approximately 6.5 kilometers southwest of the study area and is the closest station with climate normal data. The reported long-term normal annual precipitation for the period between 1981 and 2010 is 872 mm based on data from the Environment Canada Oshawa WPCP monitoring station (Station 6155878 - 43º52’00’’N, 78º50’00’’W, elevation 83.80 masl).

5.0 Geology

5.1 Surficial Geology

Surficial geology mapping (Figure 4) published by the Ontario Geological Survey (2003) illustrates that the study area is underlain by coarse-textured glaciolacustrine deposits of sand, gravel, minor silt and clay. There are also occasional bands of till, stone poor, sandy silt to silty sand textured till at the west edge of the study area and close to Farewell Creek. The OGS mapping also shows deposits of modern alluvium along Farewell Creek. Drumlins or Drumlinoid features are also mapped in the area north of the study area by the OGS.

The thickness of the overburden sediments has been interpreted to be in the region of 50 m by the Oak Ridges Moraine Groundwater Program (ORMGP). The ORMGP estimates that the coarse textured sands are up to 5 m thick and are underlain by the Halton or Newmarket tills. The ORMGP also interprets that the bedrock is immediately overlain by the Thorncliffe Formation.

Drilling records for various boreholes and groundwater monitoring wells in the vicinity of the study area indicate that the surficial soils comprise topsoil/clay of up to 3 m thickness underlain by a sand to gravel layer that is up to 10 m thick.

5.2 Bedrock Geology

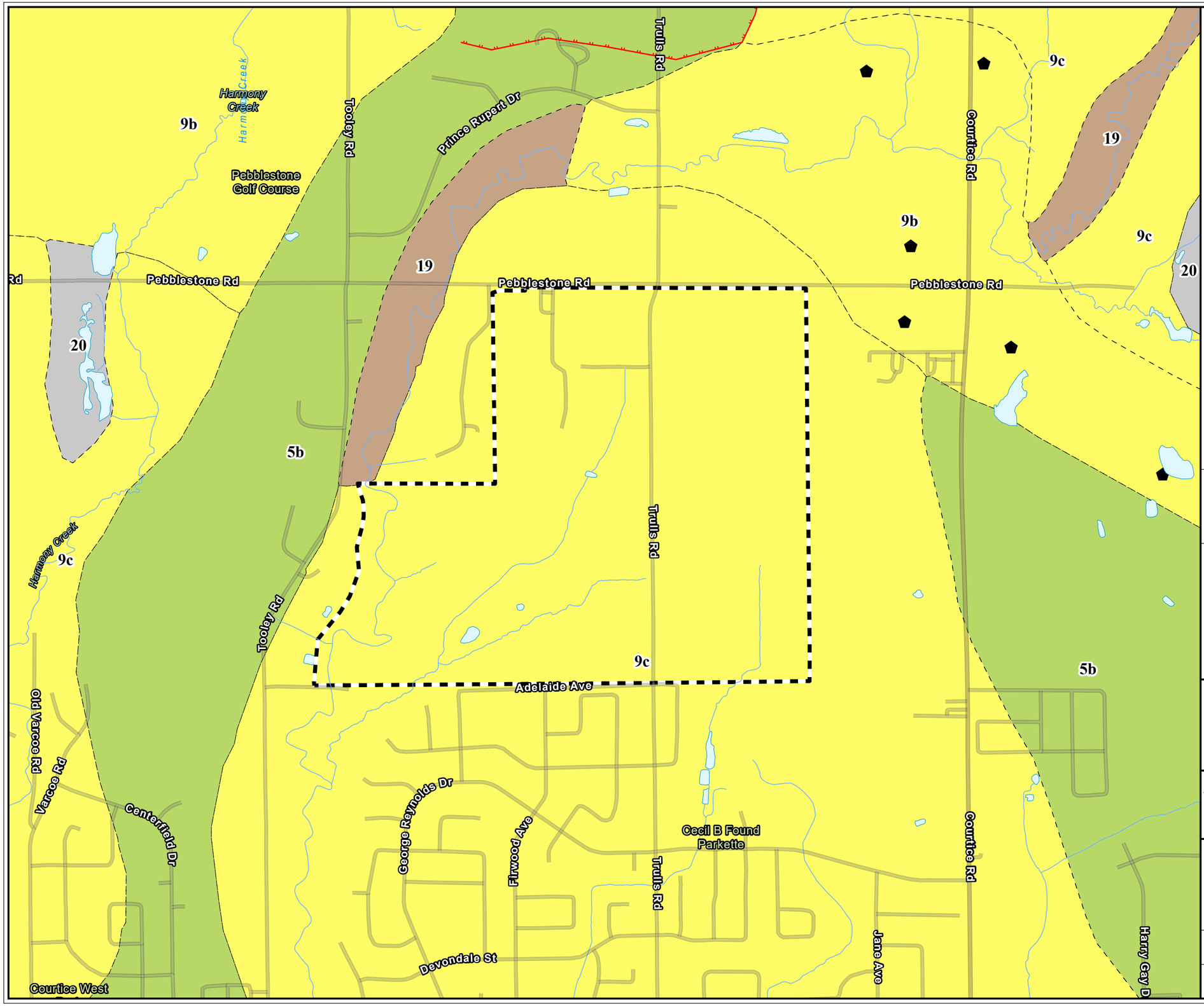
Published bedrock geology mapping of the area (Figure 5) from the OGS indicates the study area is underlain by shale, limestone, dolostone and siltstone of the Georgian Bay Formation; Blue Mountain Formation; Billings Formation; Collingwood Member, Eastview Member (OGS, 2010). Information from the ORMGP indicates that the bedrock is at elevations of approximately 95 to 97 masl and generally in the region of 50 m below existing grade.

5.3 Stratigraphy

The MECP maintains a database that provides geological records of wells drilled in the province. The database includes geological information for each well locations that is included. These records have been referenced, along with geological information obtained from local geotechnical boreholes and groundwater observation wells to assess the regional stratigraphy. Drilling records for various boreholes and groundwater monitoring wells in the vicinity of the study area are provided in Appendix B. These records indicate that the surficial soils comprise of topsoil that is underlain by a sand and gravel aquifer. Hydrogeologically, the topsoil layer acts as a confining layer (aquitard) and restricts groundwater flow; however, where the sand layer (aquifer) is close to or at surface, groundwater seepage may occur.

The ORMGP online database includes stratigraphic interpretations from groundwater models that have been completed and calibrated across the ORMGP coverage area. The models completed cover the Farewell Heights study area and the ORMGP interpretations were reviewed as part of the current assessment. The data reviewed has been interpreted using a schematic geological cross-section that is provided as Figure 7 in the current assessment. The alignment of the cross-section and the wells used for its construction are shown in Figure 6.

The cross-section shows that the surficial sediments across the study area consist of coarse-grained sediments at or close to surface across the study area and extending to the area of known drumlins to the north. The surficial coarse-grained sediments are interpreted to act as shallow aquifer system with the elevation of recharge areas in drumlins to the north acting as a driver for above grade heads where the aquifer is exposed at ground surface. Based on the geological setting, our interpretation is that groundwater recharge occurs to the north of the study area in sand layers in drumlins and these sand layers convey groundwater southward and into the study area. The available well records and the ORMGP indicate that there are clay layers in the subsurface that are associated with the Upper Halton till. The Halton till is recognized as an aquitard with limited potential for groundwater movement. The Halton till; therefore, acts to separate the shallow sand aquifer from the deeper Thorncliffe Formation.



SECONDARY PLAN AREA

WATERBODY

WATERCOURSE

SAND AND GRAVEL PIT

BLUFF

UNIT CONTACT BOUNDARY

5B: TILL: STONE-POOR, CARBONATE-DERIVED SILTY TO SANDY TILL

9B: COARSE-TEXTURED GLACIOLACUSTRINE DEPOSITS: LITTORAL-FORESHORE DEPOSITS

9C: COARSE-TEXTURED GLACIOLACUSTRINE DEPOSITS: FORESHORE-BASINAL DEPOSITS

19: MODERN ALLUVIAL DEPOSITS

20: ORGANIC DEPOSITS

Sources:

1. Ministry of Natural Resources and Forestry,© King's Printer for Ontario.
2. Natural Resources Canada,© His Majesty the King in Right of Canada.
3. Ontario Geological Survey 2010. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 128 – Revised.

Datum: North American 1983 CSRS

Coord. System: NAD 1983 CSRS UTM Zone 17N

0 100 200 300 400 500

Meters

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Figure Title

FAREWELL HEIGHTS SECONDARY PLAN
EXISTING CONDITIONS HYDROGEOLOGY REPORT

SURFICIAL GEOLOGY

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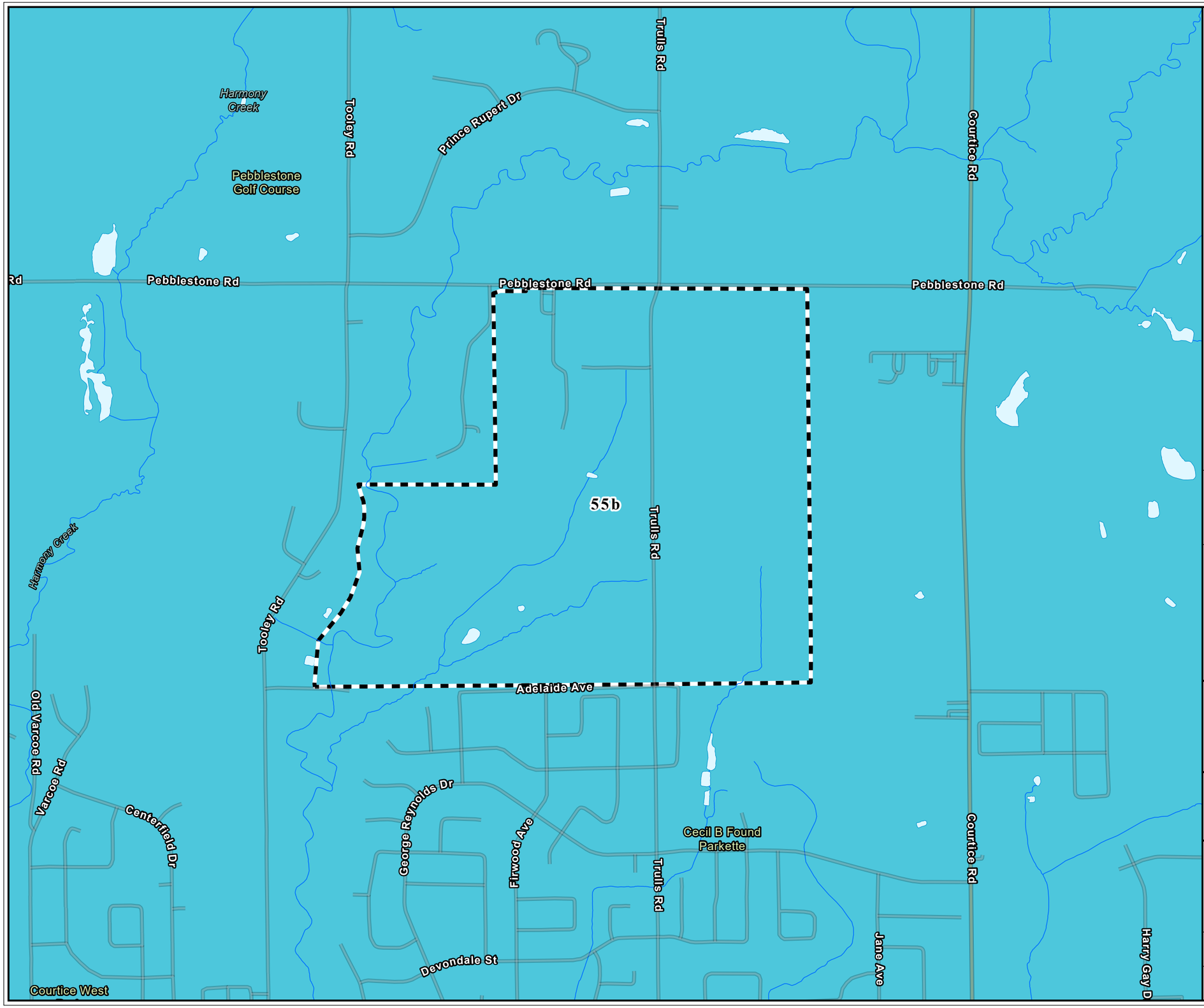

SECONDARY PLAN AREA

WATERCOURSE

WATERBODY

55B GEORGIAN BAY FM.; BLUE MOUNTAIN FM.; BILLINGS FM.; COLLINGWOOD MB.; EASTVIEW MB. MINSTR:

Sources:

1. Ministry of Natural Resources and Forestry,© King's Printer for Ontario.
2. Natural Resources Canada © His Majesty the King in Right of Canada
3. Ontario Geological Survey 2011. 1:250 000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release–Data 126 - Revision 1.

Datum: North American 1983 CSRS

Coord. System: NAD 1983 CSRS UTM Zone 17N

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Figure Title

FAREWELL HEIGHTS SECONDARY PLAN
EXISTING CONDITIONS HYDROGEOLOGY REPORT

BEDROCK GEOLOGY

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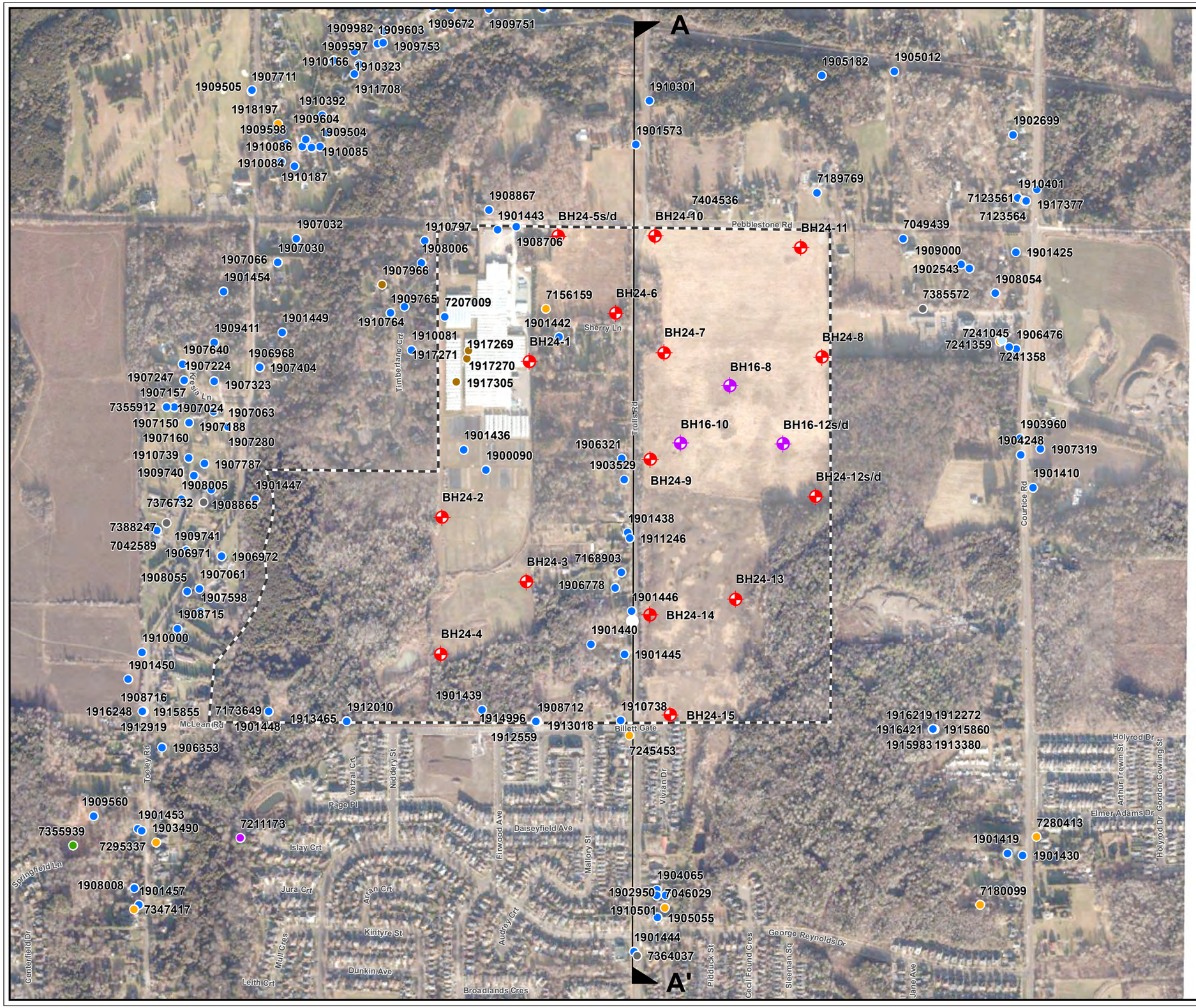

SECONDARY PLAN AREA

MONITORING WELL (DSC, 2024)

BOREHOLE / MONITORING WELL (DSC, 2016)

MECP WELL STATUS:

- WATER SUPPLY
- OBSERVATION
- MONITORING & TEAT HOLE
- TEST HOLE
- ABANDONED - OTHER
- ABANDONED - QUALITY
- ABANDONED - SUPPLY
- UNKNOWN

CROSS-SECTION LOCATION KEY

Sources:

1. Ministry of Natural Resources, © King's Printer for Ontario
2. Natural Resources Canada © His Majesty the King in Right of Canada.
3. Satellite Imagery obtained fromhttps://gis.clarington.net/arcgis/services/Cached_Basemaps/Aerial_2023_WebMercator/ImageServer

Datum: North American 1983 CRSR
Coord. System: NAD 1983 CSRS UTM Zone 17N

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Figure Title

FAREWLL HEIGHTS SECONDARY PLAN
EXISTING CONDITIONS HYDROGEOLOGY REPORT

MONITORING AND CROSS-SECTION LOCATION PLAN

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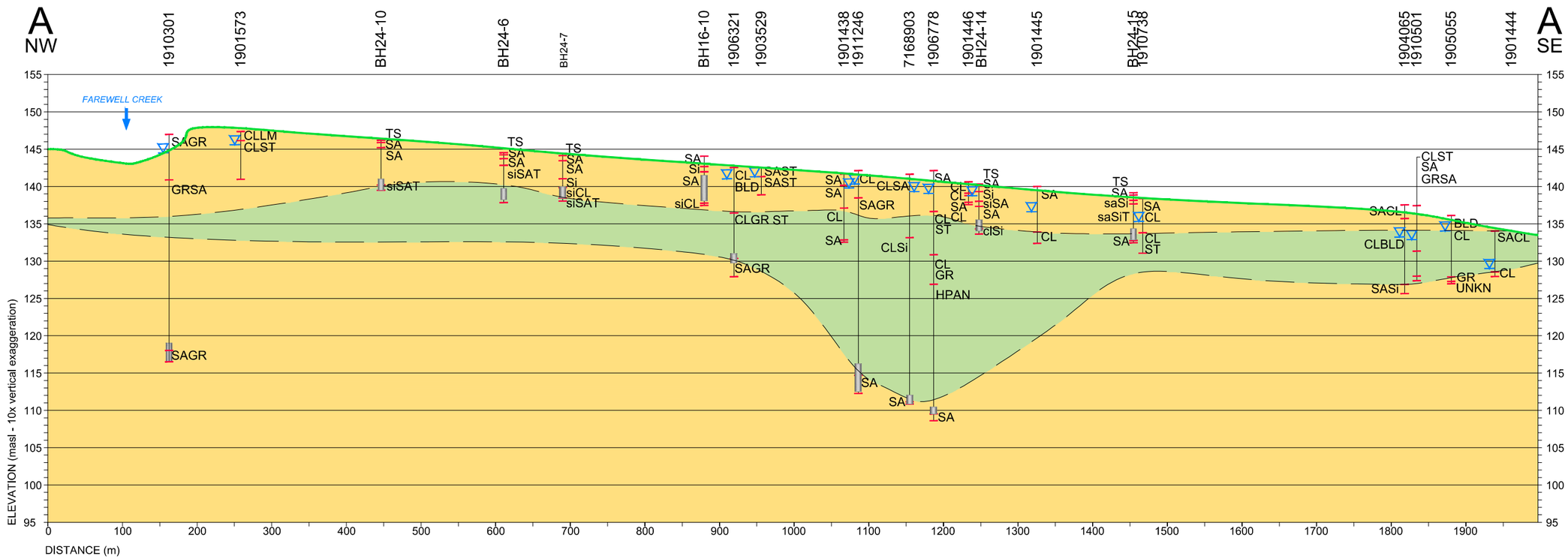

BH1 — WELL NUMBER / ID

EXISTING GROUND PROFILE

GEOLOGICAL CONTACT

STATIC WATER LEVEL (MECP WELL RECORD)

MEASURED WATER LEVEL (JUNE 2019 - masl)

WELL SCREEN

si	SILTY
sa	SANDY
cl	CLAYEY
gr	GRAVELY
TS	TOPSOIL
LM	LOAM
GR	GRAVEL
SA	SAND
Si	SILT
CL	CLAY
ST	STONES
BLD	BOULDER

INTERPRETED STRATIGRAPHY

SILTY CLAY TILL / SILTY CLAY

SAND / GRAVEL

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Figure Title

FAREWELL HEIGHTS SECONDARY PLAN
EXISTING CONDITIONS HYDROGEOLOGY REPORT
INTERPRETED GEOLOGICAL CROSS-SECTION A-A'

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6.0 Hydrogeology

6.1 Local Groundwater Use

There is no municipal groundwater use and no identified Well Head Protection Areas (WHPA) in the study area. The Source Water Information Atlas (MECP, 2024) indicates that there are Significant Groundwater Recharge Areas (SGRA) and Highly Vulnerable Aquifers (HVA) in the study area. The presence of these zones is attributed to the presence of the shallow sand aquifer that serves as a source for local water supply wells.

A review of MECP well records indicates that local supply wells are generally between 3 m and up to 73 m deep. The shallow supply wells tap the overburden sediments while those that are over 50 m deep are interpreted to tap the bedrock. Well completion depths in the overburden are varied and dependent on the extent of coarse-grained sediments (sands and gravels) encountered during drilling. A review of the water well records for an area approximately 500 m offset from the study area (Figure 6) shows 178 water well records with static water level ranging between 0.3 m to 15.5 m below grade in the upper portions of the overburden. Typically, the coarse-grained sediments form relatively productive aquifers with well yields being noted to be between 4.5 L/min and 159 L/min. Most wells are however rated at below 45 L/min.

The water well records indicate that a significant number of the water wells on record are noted as being bored wells with large diameter (76 to 91 cm) concrete casings. These wells are typically completed to shallow depths of 3 to 10 m within sand layers. These wells are generally the most vulnerable due to shallow completion and the absence of an annular seal around the well casing.

The proposed development will be municipally-serviced and in the long-term, it is anticipated that municipal supply will be available across the entire study area. There is no proposed groundwater use for the development but there may be continued use of groundwater for private well supplies in the areas surrounding the proposed development. It is important that the development does not disrupt these local water supplies. In order to better understand private water use in the area a well survey and baseline monitoring program is recommended to be completed ahead of the start of construction.

6.1.1 Aquifer Vulnerability

Aquifer vulnerability refers to the susceptibility of the aquifer to potential contamination. Some degree of protection for groundwater quality from natural and human impacts is provided by the soil above the water table. The degree of protection is dependent upon the depth to the water table (for unconfined aquifers) or the depth of the aquifer (for confined aquifers) and the type of soil above the water table or aquifer. As these two

properties vary over any given area, the degree of protection or vulnerability of the groundwater to contamination also varies. The aquifer vulnerability for the study area was mapped as part of source protection mapping included in the CTC Approved Source Protection Assessment Report. The high aquifer vulnerability mapping for the study area is provided in Figure 9. The area of high aquifer vulnerability is shown in the northern sections of the study area and is interpreted to be associated with the occurrence of coarse-grained materials in the subsurface.

6.2 Groundwater Levels

Groundwater monitoring locations are shown on Figure 7. Groundwater monitoring has taken place in the study area since March 2024. All of the monitoring wells are screened in sand to silty sand / sandy silt with the exception of MW24-12d and MW24-13 that are screened in silt and MW24-7 and MW24-9 that are screened in silty clay.

The groundwater level readings collected to date have shown groundwater generally within 1 to 2 m of existing grade. Groundwater levels have shown a slight decline over the spring into the summer which is consistent with the expected seasonal trends in southern Ontario.

6.3 Groundwater Flow Conditions

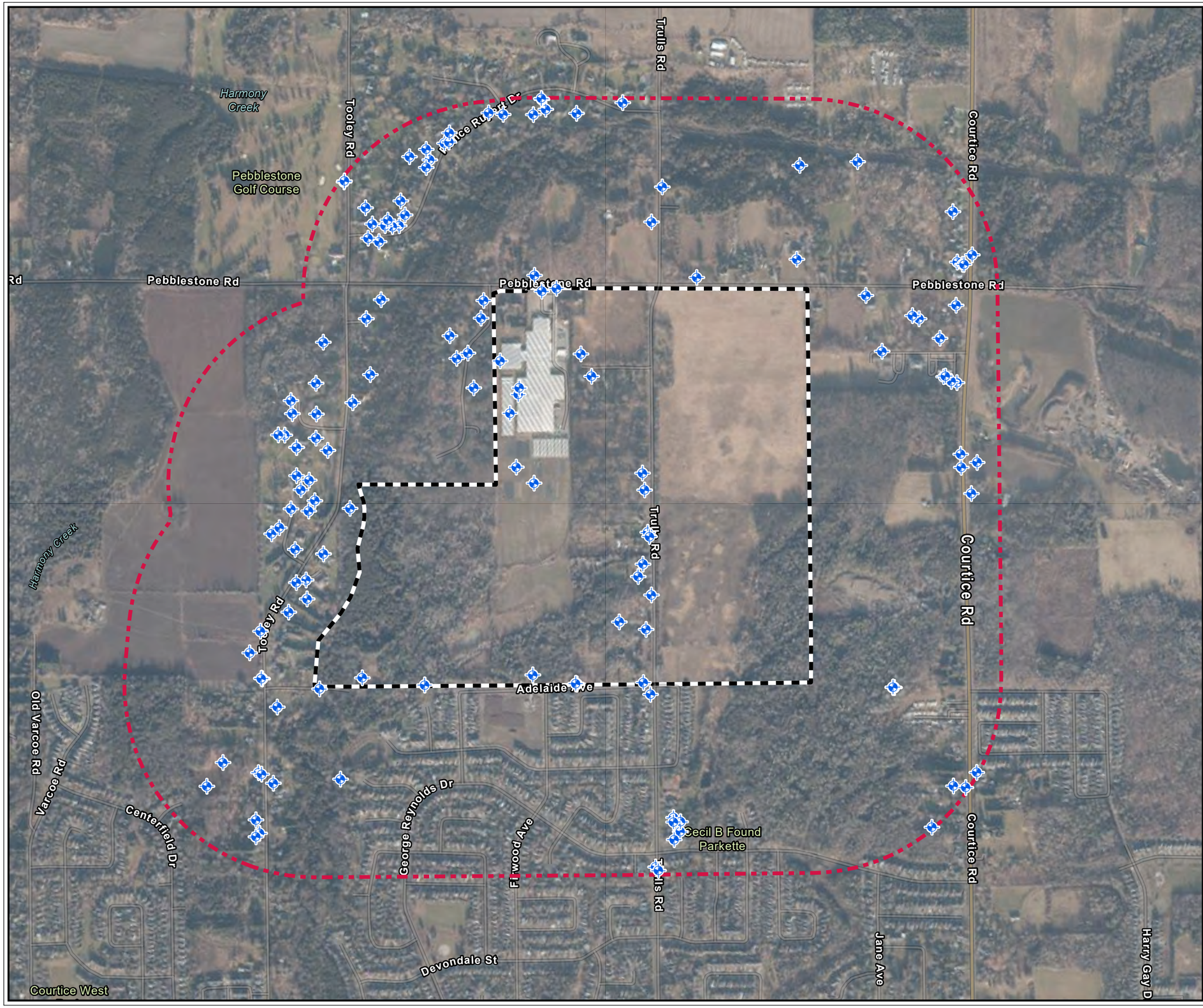
The groundwater flow patterns are generally expected to reflect the topography and physiography of the study area. Regionally there is a southwesterly slope and groundwater is expected to flow in this direction. Information from the ORMGP indicates a general southwesterly flow across the study area with some convergence along Farewell Creek to the west of the study area.

6.4 Recharge and Discharge Conditions

Based on observed conditions in the field it is interpreted that groundwater discharge gradients exist in the shallow sand layers and that where these layers are connected to the surface, groundwater discharge is occurring. Groundwater discharge is interpreted to be supporting local wetlands and potentially also discharges to Farewell Creek. Groundwater recharge is interpreted to occur in sandy layers in the drumlins to the north and to travel south following the groundwater flow direction. The topographic elevation of the recharge areas as compared to the study area has resulted in near surface groundwater conditions. Where connections to the surface exist, groundwater flow has been observed as seeps and springs. Wetland vegetation within the study area may also be supported by shallow groundwater conditions. Groundwater outflow from wetland areas may support flow in some of the tributaries to Farewell Creek that arise within the study area.

6.4.1 Significant Groundwater Recharge Areas

Significant Groundwater Recharge Areas (SGRAs) can be described as areas that can effectively move water from the surface through the unsaturated soil zone to replenish available groundwater resources. SGRAs were mapped as part of regional source protection mapping and included in the CTC Source Water Protection Assessment Report as a requirement of the *Clean Water Act*, 2006 and based on guidance provided by the MECP. The delineation of these areas was completed using numerical models and analyses at a regional scale that included the evaluations of numerous factors including precipitation, land use, soil type, topography and vegetation to predict groundwater recharge. SGRA was mapped in the northern, western and eastern portions of the study area and mainly align with areas outside of those designated as wetland (Figure 9). The designation of SGRA is interpreted as being associated with the occurrence of coarse-grained layers in the subsurface. The noted groundwater levels in the shallow subsurface and the presence of discharge gradients suggests that recharge is very limited in these areas.



SECONDARY PLAN BOUNDARY

500M BUFFER

MECP WELL RECORD

Sources:

1. Ministry of Natural Resources and Forestry,© King's Printer for Ontario.
2. Natural Resources Canada © His Majesty the King in Right of Canada

Datum: North American 1983 CSRS

Coord. System: NAD 1983 CSRS UTM Zone 17N

0 100 200 300 400 500

Meters

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FOR: MUNICIPALITY OF CLARINGTON

Figure Title

FAREWELL HEIGHTS SECONDARY PLAN
EXISTING CONDITIONS HYDROGEOLOGY REPORT

MECP WELL RECORD LOCATIONS

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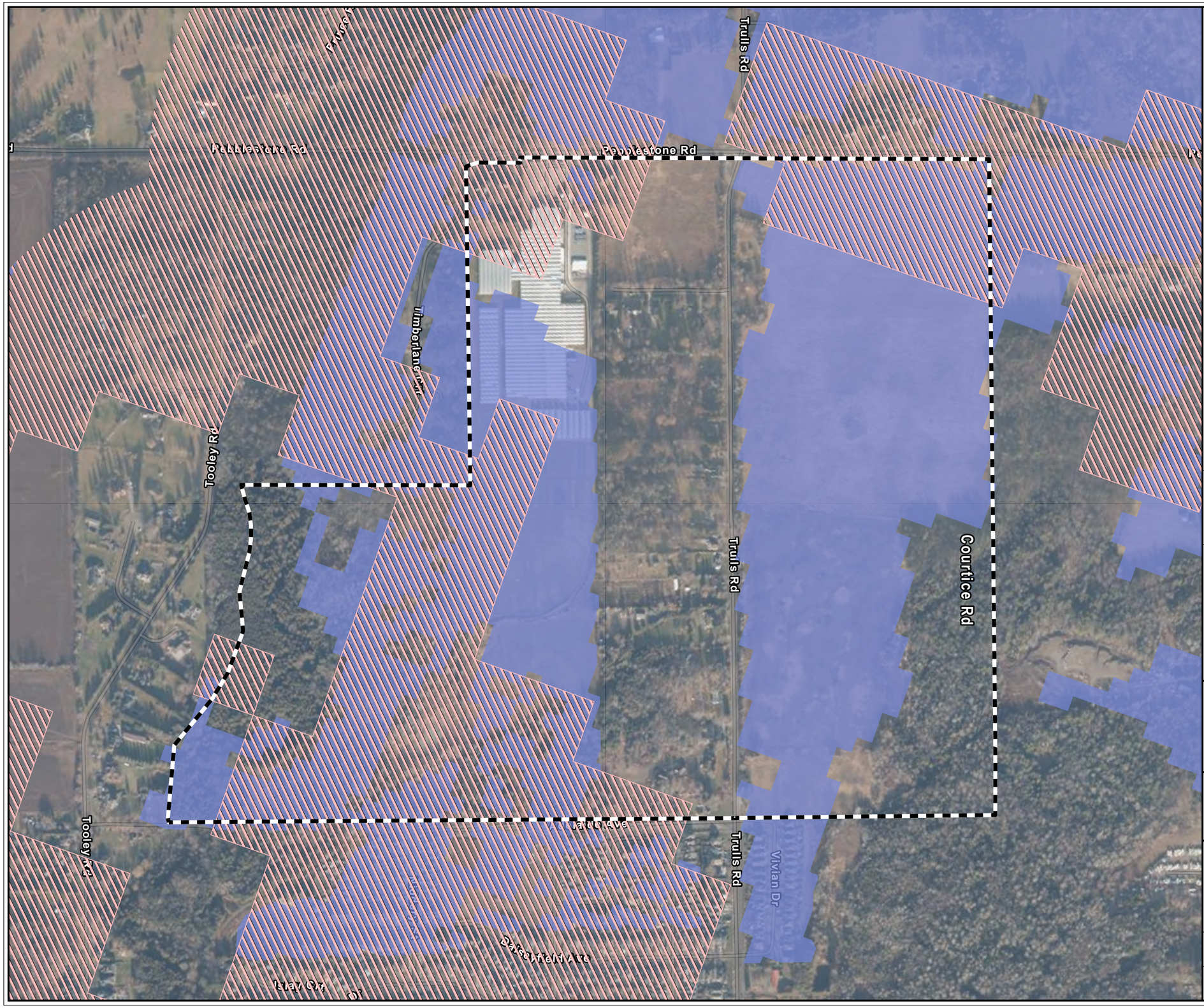

SECONDARY PLAN BOUNDARY

SIGNIFICANT GROUNDWATER RECHARGE AREAS (SGRA)

HIGHLY VULNERABLE AQUIFER (HVA)

Sources:

1. Ministry of Natural Resources and Forestry,© King's Printer for Ontario.
2. Natural Resources Canada © His Majesty the King in Right of Canada
3. HVA and SGRA mapping made available through ArcGis online mapping service, CLOCA 2024.

Datum: North American 1983 CSRS

Coord. System: NAD 1983 CSRS UTM Zone 17N

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TRUSTEE: FAREWELL HEIGHTS LANDOWNERS GROUP
FOR: MUNICIPALITY OF CLARINGTON

Figure Title

FAREWELL HEIGHTS SECONDARY PLAN
EXISTING CONDITIONS HYDROGEOLOGY REPORT

AQUIFER VULNERABILITY

Drawn	Checked	Date	Figure No.
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File Path: X:\056758 (Farewell Heights)\08_GIS\HYDRG\056758 Farewell Heights HG\056758 Farewell Heights HG.aprx: MECP WELL LOCATIONS Print Date: 2024/11/15 Time: 11:00 AM

7.0 Potential Development Impacts

7.1 Impact Assessment

The development of an area includes the creation of impermeable surfaces which had not previously existed. The addition of impermeable surfaces results in a loss of infiltration and an increase in runoff. The reduction in infiltration that may occur with land development may not affect local groundwater patterns as groundwater recharge in areas north of the study area have been interpreted as driving the groundwater flow patterns and groundwater levels across the study area.

More significant to the water table and groundwater flow conditions will be the removal of the extensive agricultural field tile drainage system that has been installed in some parts of the study area. The tile system appears to remove water from below one parcel and direct it to flow southward as surface water out of the study area. The zone of influence over which the water table is being lowered has been estimated to be between 14 to 24 m from the edges of the field. Within this zone the lowering of the water table may have impacts on vegetation that is dependent on groundwater support. With the removal of the tile drainage system or the removal of the outlet, the water table is expected to rise to pre-tile levels and reduce the potential for vegetation impacts. Over the long-term, groundwater in parts of the study area have been noted to be shallow and when tiles are eventually removed, groundwater will return to shallow conditions in the areas currently tiled. Shallow groundwater will need to be controlled for both servicing and construction of houses. In the long-term, permanent groundwater control may be required, if basement elevations are situated within the groundwater body.

The long-term control of groundwater may have implications for continued use of private wells as local groundwater control systems may impact groundwater flow in areas where shallow private wells remain in use. It is important to obtain an up-to-date assessment of well use in the study area to confirm whether vulnerable wells are still in use. A well survey should be completed prior to the start of any construction activities to obtain more up-to-date information on well use in the study area.

Where environmental features are dependent on groundwater input it will also be important to determine these linkages and suitable mitigation measures for impacts to groundwater will need to be developed in order to safeguard groundwater input to environmental features.

7.2 Potential Mitigation Measures

7.2.1 Construction Below the Water Table

Available groundwater level data indicates that shallow groundwater conditions are present across the study area. Should excavations completed during construction of

servicing extend below the water table the local soils may need to be dewatered. The volume of water required for dewatering is dependent on the hydrogeological properties of the sediments and the depth of the excavation. The removal of subsurface water (dewatering) to facilitate construction is regulated by the MECP. Water taking in excess of 50,000 L/day but less than 400,000 L/day is regulated via an Environmental Sector Activity Registry (EASR) process. For takings in excess of 400,000 L/day, a Permit to Take Water (PTTW) will be required in accordance with provincial regulations prior to dewatering activities. Detailed groundwater impact assessment and monitoring plans are required to support EASR and PTTW applications. These studies should be completed once servicing depths are available.

The construction of buried services below the water table has the potential to capture and redirect groundwater flow through more permeable fill materials typically placed in the base of excavations. Groundwater may also infiltrate into joints in storm sewers and manholes. Over the long-term, these impacts can lower the groundwater table across the development area. To mitigate this effect, services to be installed below the water table should be constructed to prevent redirection of groundwater flow. This will involve the use of anti-seepage collars or clay plugs surrounding the pipes to provide barriers to flow and prevent groundwater flow along granular bedding material and erosion of the backfill materials.

7.2.2 Local Groundwater Supply Wells

The review of the MECP water well database has indicated that there may be residences within the study area that are supplied by private wells. A water well survey should be completed before the start of any construction activities to ascertain the status and condition of any private wells within 500 m of the study area. The survey should seek to update whether wells are present and in use and evaluate the potential vulnerability of each well to the proposed construction activities. As previously noted, the well survey should be completed to serve as an indication of the baseline conditions in the study area. The well survey should form the first step in an impact mitigation plan that should include the following elements:

Baseline well survey to indicate which wells are still in use and seek permission from select landowners to obtain information on well yield and water quality. All information obtained during the well survey will serve as baseline information for the remainder of the secondary plan process. The well survey should be completed ahead of any construction and should include multiple water samples (at least two seasons) to understand the potential range of water quality variations.

At a minimum of two weeks before the start of any construction, all residents within the 500 m radius of the study area should be made aware of the proposed start-up of activities and all residents provided with a contact name for a person who can be contacted for known or suspected episodes of well interference.

On receipt of any well interference complaints, the contact person will activate an interference response mechanism that includes the entity undertaking the work providing a temporary supply of water while the remainder of the response is activated.

Following any complaint, the project hydrogeologist should be contacted to initiate an investigation into the nature and cause of the complaint. The project hydrogeologist should seek to complete the investigation within one week of being notified. The project hydrogeologist will produce a report that outlines their analysis of the cause of the interference, determine whether it was likely caused by the work being undertaken and make recommendations on the long-term remediation of the impacts. It is noted that the hydrogeologist's recommendations could include, continued replacement supply until impact has abated, well replacement or that the impact is not related to construction and therefore no further remedial action is required. The project hydrogeologist's report should be provided to the resident making the complaint, the MECP and the municipality.

The interference response mechanism should remain in place for the duration of servicing and construction of all phases but should also be dependent on private water supply wells being maintained in the study area.

7.2.3 Natural Feature Support

As previously indicated, wetland features across the study area have been interpreted to be supported by groundwater discharge or shallow groundwater conditions. In order to ensure that groundwater continues to discharge to features or that shallow groundwater conditions support wetlands it is important to ensure that groundwater re-direction does not occur (see Section 7.2.1). If long-term groundwater control is required, then groundwater discharge from control systems should be directed so as to cause support to required environmental features. It will be necessary to coordinate any required long-term groundwater control systems with natural heritage planning to ensure that groundwater gets to the appropriate locations within the study area.

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

MECP Well Records

FID	WELL TAG AUDIT	TOWNSHIP CON LOT	TOWNSHIP_C	DATE CNTR	CASING DIA	CASING_DIA	PUMP TEST	WELLS USE	WELLS_USE	SCREEN
0	210	7046029 (Z56501) A	NEWCASTLE TOWN (DARL 03 030	17 677303 4865348 W	2007/05 4102					
1	3403	7049439 (Z59066) A050706	NEWCASTLE TOWN (DARL 03 029	17 677293 4866839 W	2007/06 2662	6.25	FR 0052	16/20/5/1:	DO	0053 4
2	80181	1900090 ()	NEWCASTLE TOWN (DARL CON 03 031	17 676635 4866083 W	1955/08 2632	36	FR 0013	8///:	DO	
3	81538	1901410 ()	NEWCASTLE TOWN (DARL CON 03 028	17 677728 4866441 W	1964/04 2615	36	FR 0012	8///:	DO	
4	81547	1901419 ()	NEWCASTLE TOWN (DARL CON 03 029	17 677940 4865701 W	1958/05 2615	36	FR 0020	18///:	DO	
5	81553	1901425 ()	NEWCASTLE TOWN (DARL CON 03 029	17 677525 4866894 W	1961/12 2202	4	FR 0057	18/40/3/4:0	DO	
6	81558	1901430 ()	NEWCASTLE TOWN (DARL CON 03 029	17 677972 4865708 W	1965/03 2104	6	FR 0092	20/80/6/3:0	DO	0088 5
7	81564	1901436 ()	NEWCASTLE TOWN (DARL CON 03 031	17 676577 4866107 W	1955/08 2632	36	FR 0005	5///:	DO	
8	81566	1901438 ()	NEWCASTLE TOWN (DARL CON 03 031	17 676960 4866061 W	1957/11 2113	6	FR 0030	6/8/7/12:0	DO	
9	81567	1901439 ()	NEWCASTLE TOWN (DARL CON 03 031	17 676800 4865607 W	1958/08 2615	36	FR 0010	10///:	DO	
10	81568	1901440 ()	NEWCASTLE TOWN (DARL CON 03 031	17 676968 4865814 W	1959/05 2615	36	FR 0017	12///:	DO	
11	81570	1901442 ()	NEWCASTLE TOWN (DARL CON 03 031	17 676684 4866398 W	1961/08 5412	30	FR 0004	4//2/:	DO	
12	81571	1901443 ()	NEWCASTLE TOWN (DARL CON 03 031	17 676486 4866565 W	1964/09 5412	30	FR 0015	10//2/:	DO	
13	81572	1901444 ()	NEWCASTLE TOWN (DARL CON 03 031	17 677273 4865239 W	1965/06 5412	30	FR 0008	15//1/:	DO	
14	81573	1901445 ()	NEWCASTLE TOWN (DARL CON 03 031	17 677041 4865819 W	1965/06 5412	30	FR 0008	10//1/:	DO	
15	81574	1901446 ()	NEWCASTLE TOWN (DARL CON 03 031	17 677024 4865909 W	1966/08 2202	30	FR 0009	6/8/1/:	DO	
16	81575	1901447 ()	NEWCASTLE TOWN (DARL CON 03 032	17 676201 4865859 W	1957/11 2615	36	FR 0010	11///:	DO	
17	81576	1901448 ()	NEWCASTLE TOWN (DARL CON 03 032	17 676380 4865450 W	1965/10 5412	30	FR 0012 FR 0025	17//1/:	DO	
18	81577	1901449 ()	NEWCASTLE TOWN (DARL CON 03 032	17 676134 4866208 W	1966/08 5412	30	FR 0023	23//1/:	DO	
19	81578	1901450 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676079 4865413 W	1953/07 2615	36	FR 0020	10///:	DO	
20	81581	1901453 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676206 4865124 W	1955/05 2632	36	FR 0016	19///:	DO	
21	81582	1901454 ()	NEWCASTLE TOWN (DARL CON 03 033	17 675989 4866247 W	1956/07 2632	36	FR 0027	15///:	DO	
22	81585	1901457 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676262 4864975 W	1961/11 2615	36	FR 0051	48///:	DO	
23	81701	1901573 ()	NEWCASTLE TOWN (DARL CON 04 031	17 676697 4866833 W	1965/05 2615	36	FR 0020	6//6/:	PS	
24	82680	1902543 ()	NEWCASTLE TOWN (DARL CON 03 029	17 677445 4866828 W	1968/06 2202	4	FR 0080	10/30/18/7:0	DO	0081 4

FID	WELL TAG AUDIT	TOWNSHIP CON LOT	TOWNSHIP_C	DATE CNTR	CASING DIA	CASING_DIA	PUMP TEST	WELLS USE	WELLS_USE	SCREEN
25	82832	1902699 ()	NEWCASTLE TOWN (DARL CON 04 029	17 677435 4867123 W	1969/05 2214	30	FR 0030	20/30/6/1:0	DO	
26	83043	1902950 ()	NEWCASTLE TOWN (DARL CON 03 030	17 677295 4865373 W	1970/10 2214	30	FR 0030	27/37//:	DO	
27	83546	1903490 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676215 4865123 W	1972/08 2104	6 6	FR 0166	36/163/5/2:30	DO	
28	83584	1903529 ()	NEWCASTLE TOWN (DARL CON 03 031	17 676915 4866163 W	1972/11 1556	30	FR 0004	4/11//1:0	DO	
29	83601	1904248 ()	NEWCASTLE TOWN (DARL CON 03 029	17 677680 4866497 W	1975/11 2104	6	FR 0035	6/30/30/4:0	DO	0030 8
30	84035	1903960 ()	NEWCASTLE TOWN (DARL CON 03 029	17 677667 4866529 W	1974/08 2214	30	FR 0010	10/23/7/1:0	DO	
31	84134	1904065 ()	NEWCASTLE TOWN (DARL CON 03 030	17 677274 4865377 W	1974/11 1556	30	FR 0035	14/38/10/1:0	DO	
32	84886	1905012 ()	NEWCASTLE TOWN (DARL CON 04 029	17 677155 4867163 W	1978/05 3129	30	FR 0015	10/23/7/1:0	DO	
33	84929	1905055 ()	NEWCASTLE TOWN (DARL CON 03 030	17 677295 4865323 W	1978/06 2104	6	FR 0027	7/20/10/3:0	MN CO	
34	85047	1905182 ()	NEWCASTLE TOWN (DARL CON 04 030	17 677015 4867103 W	1978/10 5102	6	UK 0180	2/20/30/1:40	DO	0177 10
35	85374	1905465 ()	NEWCASTLE TOWN (DARL CON 03 028	17 678015 4865743 W	1976/06 1845	6	FR 0095	8/75/6/1:30	DO	
36	86135	1906321 ()	NEWCASTLE TOWN (DARL CON 03 031	17 676895 4866203 W	1982/04 2104	6	FR 0044 FR 0048	5/35/15/5:30	DO	0038 4
37	86162	1906353 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676195 4865303 W	1982/06 2214	30	FR 0029	15/20/10/0:30	DO	
38	86270	1906476 ()	NEWCASTLE TOWN (DARL CON 03 029	17 677595 4866703 W	1982/08 2214	30	FR 0010	10/18/6/0:30		
39	86479	1906778 ()	NEWCASTLE TOWN (CLAR CON 03 031	17 676975 4865943 W	1983/11 3136	6	FR 0107	10/105/2/1:0	DO	0104 3
40	86629	1906968 ()	NEWCASTLE TOWN (DARL CON 03 032	17 676115 4866123 W	1984/06 2104	6	UK 0058	9/40/4/12:0	DO	
41	86632	1906971 () A	NEWCASTLE TOWN (DARL CON 03 033	17 676175 4865723 W	1984/06 2104	6	UK 0152	95///24:0		0149 4
42	86633	1906972 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676175 4865723 W	1984/06 2104	6	UK 0064	1/20/5/14:0	DO	
43	86684	1907024 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676015 4865963 W	1984/08 2104	6	UK 0058	25/40/5/8:0	DO	
44	86690	1907030 ()	NEWCASTLE TOWN (DARL CON 03 032	17 676075 4866343 W	1984/07 2214	30	FR 0006	6/12/6/0:30	DO	
45	86692	1907032 ()	NEWCASTLE TOWN (DARL CON 03 032	17 676095 4866403 W	1984/08 2214	30	FR 0015	10/20/6/0:30	DO	
46	86720	1907061 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676155 4865643 W	1984/10 2104	6	UK 0087	4/24/8/2:0	DO	
47	86722	1907063 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676095 4865983 W	1984/10 2104	6	UK 0056	5/40/4/15:0	DO	
48	86725	1907066 ()	NEWCASTLE TOWN (DARL CON 03 032	17 676075 4866343 W	1984/10 2104	6	UK 0022	10/15/15/1:0	DO	
49	86801	1907150 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676015 4865963 W	1985/01 2104	6	UK 0050 UK 0053	10/40/3/3:30	DO	0044 4

FID	WELL TAG AUDIT	TOWNSHIP CON LOT	TOWNSHIP_C	DATE CNTR	CASING DIA	CASING_DIA	PUMP TEST	WELLS USE	WELLS_USE	SCREEN
50	86808	1907157 ()	NEWCASTLE TOWN (DARL CON 03 033	17 675975 4865983 W	1984/12 2104	6	UK 0035 UK 0036	5/30/3/4:0	DO	
51	86811	1907160 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676015 4865963 W	1984/12 2104	6	UK 0020 UK 0021	10/15/6/2:30	DO	
52	86837	1907188 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676015 4865963 W	1985/02 2104	6	UK 0021 UK 0023	10/18/3/2:30	DO	0014 4
53	86873	1907224 ()	NEWCASTLE TOWN (DARL CON 03 033	17 675975 4866043 W	1985/02 2104	6	UK 0030 UK 0031	5/28/4/12:0	DO	
54	86882	1907323 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676035 4866063 W	1985/06 2104	6	UK 0068	10/20/4/6:0	DO	0060 4
55	86945	1907247 ()	NEWCASTLE TOWN (DARL CON 03 033	17 675975 4866043 W	1985/03 2104	6	UK 0034 UK 0037	2/25/4/5:10	DO	0028 4
56	86978	1907280 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676095 4865983 W	1985/04 2104	6	UK 0058	7/59/2/42:20	DO	0053 4
57	87017	1907319 ()	NEWCASTLE TOWN (CLAR CON 03 028	17 677715 4866523 W	1985/04 2214	30	FR 0008 FR 0018	8/12/5/0:30	DO	
58	87082	1907404 ()	NEWCASTLE TOWN (DARL CON 03 032	17 676115 4866123 W	1985/08 2104	6	UK 0065 UK 0066	15/60/2/11:30	DO	0059 4
59	87132	1907454 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676055 4866003 W	1985/08 2214	30 24	FR 0035	23/30/6/0:30	DO	
60	87273	1907598 ()	NEWCASTLE TOWN (DARL CON 03 033	17 676174 4865597 W	1986/02 2104	6	UK 0042 UK 0044	3/40/3/5:0	DO	0036 4
61	87306	1907640 ()	NEWCASTLE TOWN (DARL CON 03 033	17 675960 4866074 W	1986/03 2104	6	UK 0075 UK 0077	10/70/3/5:0	DO	0068 4
62	87375	1907710 ()	NEWCASTLE TOWN (DARL CON 04 031	17 676416 4867036 W	1986/06 3136	6	FR 0111	13/100/4/1:0	DO	0113 5
63	87376	1907711 ()	NEWCASTLE TOWN (DARL CON 04 032	17 675900 4866662 W	1986/03 3136	6	FR 0086	11/80/6/1:15	DO	0088 5
64	87441	1907787 (NA)	NEWCASTLE TOWN (DARL CON 03 033	17 676075 4865893 W	1986/08 2517	6	FR 0150	11//10/2:30	DO	0155 3
65	87616	1907966 (NA) A	NEWCASTLE TOWN (DARL CON 03 032	17 676297 4866374 W	1986/08 1847	30		10/25/4/1:0	IR	
66	87654	1908005 (NA)	NEWCASTLE TOWN (DARL CON 03 033	17 676055 4865806 W	1986/11 1672	6	FR 0164	24/52/12/3:0	DO	0162 4
67	87655	1908006 (02295)	NEWCASTLE TOWN (DARL CON 03 032	17 676359 4866445 W	1986/10 2214	30	FR 0008	8/20/6/1:0	DO	
68	87657	1908008 (02300)	NEWCASTLE TOWN (DARL CON 03 033	17 676241 4865005 W	1986/10 2214		FR 0015 FR 0026	10/20/7/1:0	DO	
69	87695	1908054 (06489)	NEWCASTLE TOWN (DARL CON 03 029	17 677514 4866798 W	1986/09 1847	30 24	FR 0012	10//10/0:0	DO	
70	87696	1908055 (06494)	NEWCASTLE TOWN (DARL CON 03 030	17 676133 4865628 W	1986/08 1847	30	FR 0030	34//2/1:0	DO	
71	88313	1908706 (NA)	NEWCASTLE TOWN (DARL CON 03 031	17 676520 4866585 W	1987/10 2214	30	FR 0005 FR 0025	5/15/7/1:0	CO	
72	88319	1908712 (NA)	NEWCASTLE TOWN (DARL CON 03 031	17 676917 4865623 L	1987/10 2214	30	FR 0035	20/31/6/1:0	DO	
73	88322	1908715 (NA)	NEWCASTLE TOWN (DARL CON 03 033	17 676140 4865548 W	1987/08 2214	30	UK 0015	15/23/6/1:0	DO	
74	88323	1908716 (NA)	NEWCASTLE TOWN (DARL CON 03 033	17 676133 4865360 L	1987/08 2214	30	FR 0015	15/27/7/1:0	DO	

FID	WELL TAG AUDIT	TOWNSHIP CON LOT	TOWNSHIP_C	DATE CNTR	CASING DIA	CASING_DIA	PUMP TEST	WELLS USE	WELLS_USE	SCREEN
75	88462	1908865 (12898)	NEWCASTLE TOWN (DARL CON 03 033	17 676107 4865847 W	1987/12 1672	6	FR 0159	18/159/1/3:0	DO	0156 4
76	88464	1908867 (25242)	NEWCASTLE TOWN (DARL CON 03 031	17 676454 4866598 W	1987/11 2214	30	FR 0010 UK 0025	5/12/7/1:0	DO	
77	88521	1909672 (24081)	NEWCASTLE TOWN (DARL CON 04 031	17 676235 4866969 W	1988/02 3136	6	FR 0102	10/89/18/3:0	DO	0108 5
78	88546	1908910 (24007)	NEWCASTLE TOWN (DARL CON 03 031	17 676917 4865623 L	1988/02 3136	6	FR 0055	7/56/4/2:0	DO	0061 4
79	88635	1909000 (31380)	NEWCASTLE TOWN (DARL CON 03 029	17 677426 4866830 W	1988/04 2104	6	UK 0023 UK 0031	8/15/8/4:0		0018 8
80	88642	1909008 (25252)	NEWCASTLE TOWN (DARL CON 03 033	17 676133 4865360 L	1988/05 2214	30	FR 0010 FR 0015 FR 0025	10/15/7/1:0	DO	
81	89031	1909411 (30785)	NEWCASTLE TOWN (DARL CON 03 033	17 676007 4866139 W	1988/09 3129	30	FR 0010	8/16/8/1:0	DO	
82	89121	1909503 (27586)	NEWCASTLE TOWN (DARL CON 04 032	17 676198 4866960 W	1988/11 1413	5	FR 0085	10/80/5/2:0	DO	0081 4
83	89122	1909504 (27592)	NEWCASTLE TOWN (DARL CON 04 032	17 676075 4866602 W	1988/11 1413	5	FR 0112	8/100/3/3:30	DO	0108 4
84	89123	1909505 (27594)	NEWCASTLE TOWN (DARL CON 04 032	17 675900 4866665 W	1988/11 1413	5	FR 0125	12/91/6/1:30	DO	0117 8
85	89170	1909560 (55313)	NEWCASTLE TOWN (DARL CON 03 033	17 676109 4865118 W	1988/11 2214	30	FR 0020 FR 0023	12/24/7/1:0	DO	
86	89205	1909597 (45761)	NEWCASTLE TOWN (DARL CON 04 032	17 676040 4866782 W	1988/12 3367	6	FR 0147	28/135/6/2:15	DO	0143 4
87	89206	1909598 (45763)	NEWCASTLE TOWN (DARL CON 04 032	17 676007 4866583 W	1988/12 3367	6	FR 0099	10/89/5/2:45	DO	0095 4
88	89211	1909603 (24063)	NEWCASTLE TOWN (DARL CON 04 032	17 676115 4866846 W	1988/12 3136	6	FR 0086	8/89/4/3:0	DO	0088 5
89	89212	1909604 (24061)	NEWCASTLE TOWN (DARL CON 04 032	17 676080 4866634 W	1988/11 3136	6	FR 0095	4/95/7/2:30	DO	0095 5
90	89340	1909740 (59307)	NEWCASTLE TOWN (DARL CON 03 033	17 676063 4865862 W	1847	30	FR 0039	34///1:0	DO	
91	89341	1909741 (59308)	NEWCASTLE TOWN (DARL CON 03 033	17 676101 4865709 W	1847	30	FR 0020	19///1:0	DO	
92	89351	1909751 (24075)	NEWCASTLE TOWN (DARL CON 04 031	17 676310 4866995 W	1989/03 3136	6	FR 0098	12/90/40/3:30	DO	0099 5
93	89353	1909753 (24076)	NEWCASTLE TOWN (DARL CON 04 032	17 676125 4866853 W	1989/03 3136	6	FR 0079	12/80/4/4:0	DO	0080 5
94	89365	1909765 (54795)	NEWCASTLE TOWN (DARL CON 03 032	17 676334 4866324 W	1989/04 3129	30	FR 0012	6/13/8/1:0	DO	
95	89565	1909982 (25953)	NEWCASTLE TOWN (DARL CON 03 032	17 676118 4866876 W	1989/07 2662	6	GS 0132	18/128/5/3:0	DO	0132 3
96	89583	1910000 (54921)	NEWCASTLE TOWN (DARL CON 03 033	17 676087 4865476 W	1989/07 3129	30	FR 0024	15/23/8/1:0	DO	
97	89664	1910081 (66357)	NEWCASTLE TOWN (DARL CON 03 032	17 676402 4866266 W	1989/08 1413	6	FR 0144	11//20/1:10	DO	0138 6
98	89667	1910084 (66329)	NEWCASTLE TOWN (DARL CON 04 032	17 676039 4866545 W	1989/08 1413	5	FR 0144	15/120/8/3:0	DO	0136 8
99	89668	1910085 (66328)	NEWCASTLE TOWN (DARL CON 04 032	17 676059 4866594 W	1989/08 1413	5	FR 0141	15/115/4/4:0	DO	0133 8

FID	WELL TAG AUDIT	TOWNSHIP CON LOT	TOWNSHIP_C	DATE CNTR	CASING DIA	CASING_DIA	PUMP TEST	WELLS USE	WELLS_USE	SCREEN
100	89669	1910086 (66325)	NEWCASTLE TOWN (DARL CON 04 032	17 676040 4866590 W	1989/08 1413	5	FR 0141	15/130/5/2:0	DO	0137 4
101	89678	1910323 (66015)	NEWCASTLE TOWN (DARL CON 04 032	17 676075 4866815 W	1989/11 5022	6	FR 0145	16//7/2:0	DO	0148 3
102	89773	1910128 (24098)	NEWCASTLE TOWN (DARL CON 04 031	17 676336 4867019 W	1989/08 3136	6	FR 0094	8/108/6/1:15	DO	0115 5
103	89811	1910166 (66378)	NEWCASTLE TOWN (DARL CON 04 032	17 676093 4866792 W	1989/09 1413	5	FR 0117	15/105/3/4:0	DO	0113 4
104	89831	1910187 (24107)	NEWCASTLE TOWN (DARL CON 04 032	17 676009 4866544 W	1989/09 3136	6	FR 0141	16/140/6/3:0	DO	0146 5
105	89945	1910301 (73810)	NEWCASTLE TOWN (DARL CON 04 030	17 676693 4866929 W	1989/12 2104	6	FR 0099	8/95/4/3:0	ST	0092 8
106	90028	1910392 (68326)	NEWCASTLE TOWN (DARL CON 04 032	17 676057 4866665 W	1989/12 2662	6	FR 0165	15/70/10/2:15	DO	0158 7
107	90037	1910401 (59504)	NEWCASTLE TOWN (DARL CON 04 029	17 677490 4867002 W	1989/09 2214		FR 0010	5/10/6/1:0	DO	
108	90125	1910490 (70893)	NEWCASTLE TOWN (DARL CON 04 032	17 676042 4866606 W	1990/03 1413	6	FR 0158	12//20/5:30	DO	0152 6
109	90136	1910501 (77663)	NEWCASTLE TOWN (DARL CON 03 030	17 677278 4865366 W	1990/01 2214	30	FR 0020	15/17/5/1:0	DO	
110	90201	1910566 (25989)	NEWCASTLE TOWN (DARL CON 04 032	17 676008 4866875 W	1990/04 2662	6	UK 0134	17/133/4/2:0	DO	0134 4
111	90366	1910734 (71725)	NEWCASTLE TOWN (DARL CON 03 033	17 676133 4865360 L	1990/07 3129	30	FR 0020	20/28/8/1:0	DO	
112	90370	1910738 (71727)	NEWCASTLE TOWN (DARL CON 03 031	17 677081 4865685 W	1990/07 3129	30	FR 0010	10/17/8/1:0	DO	
113	90371	1910739 (71702)	NEWCASTLE TOWN (DARL CON 03 033	17 676040 4865893 W	1990/08 3129	30	FR 0018	16/22/8/1:0	DO	
114	90396	1910764 (90708)	NEWCASTLE TOWN (DARL CON 03 032	17 676357 4866347 W	1990/08 2104	6	FR 0087	10/84/3/2:0	DO	0079 8
115	90427	1910797 (90720)	NEWCASTLE TOWN (DARL CON 03 032	17 676350 4866491 W	1990/09 2104	6	FR 0103	15/100/3/5:0	DO	0095 8
116	90862	1911246 (108045)	NEWCASTLE TOWN (DARL CON 03 031	17 676968 4866052 W	1991/09 2104	6	FR 0098	6/80/4/3:10	CO	0085 12
117	91185	1911570 (118387)	NEWCASTLE TOWN (DARL CON 04 031	17 676521 4867103 W	1992/08 2104	6	FR 0176	28/70/8/16:0	DO	
118	91322	1911708 (123523)	NEWCASTLE TOWN (DARL CON 04 032	17 676091 4866770 W	1993/05 5022	6	UK 0073	4/69/8/1:0	DO	0073 3
119	91407	1911794 (24156)	NEWCASTLE TOWN (DARL CON 04 031	17 676474 4867102 W	1993/09 3136	6	FR 0117	19/92/14/1:30	DO	
120	91623	1912010 (150122)	NEWCASTLE TOWN (DARL CON 03 032	17 676541 4865487 L	1994/07 2104	6	UK 0076	12/74/4/1:40	DO	0071 11
121	91851	1912272 (154466)	NEWCASTLE TOWN (DARL CON 03 029	17 677707 4865893 L	1994/12 2104	6	UK 0050	20/45/10/3:0	DO	
122	92083	1912919 (165211)	NEWCASTLE TOWN (DARL CON 03 033	17 676133 4865360 L	1996/07 6874	36	FR 0010	14/15/25/0:30	DO	
123	92170	1912559 (158028)	NEWCASTLE TOWN (DARL CON 03 031	17 676917 4865623 L	1995/08 6874	30	FR 0010	10/30/5/1:0	DO	
124	92201	1912591 (166371)	NEWCASTLE TOWN (DARL CON 03 029	17 677707 4865893 L	1995/09 3367	6 6	UK 0165	20/145/10/2:0	DO	

FID	WELL TAG AUDIT	TOWNSHIP CON LOT	TOWNSHIP_C	DATE CNTR	CASING DIA	CASING_DIA	PUMP TEST	WELLS USE	WELLS_USE	SCREEN
125	92601	1913018 (174453)	NEWCASTLE TOWN (DARL CON 03 031	17 676917 4865623 L	1996/10 6874	36	FR	9/12/25/1:15	DO	
126	92864	1913380 (174286)	NEWCASTLE TOWN (DARL CON 03 029	17 677707 4865893 L	1997/04 2662	6	FR 0033	8/30/6/1:30	DO	0033 4
127	92947	1913465 (178128)	NEWCASTLE TOWN (DARL CON 03 032	17 676541 4865487 L	1997/10 1413	6	FR 0120	14/83/12/1:30	DO	0115 5
128	93282	1913829 (180999)	NEWCASTLE TOWN (DARL CON 03 031	17 676917 4865623 L	1998/09 3136	6	FR 0097	/89/4/2:30	DO	0099 5
129	93818	1914354 (214688)	NEWCASTLE TOWN (DARL CON 03 031	17 676918 4865623 L	1999/12 1413	7	FR 0137	43/130/35/1:	IR	0130 6
130	94289	1914864 (207716)	NEWCASTLE TOWN (DARL CON 03 033	17 676131 4865361 L	2000/10 2214	24 18	FR 0018	7/12/3/2:	DO	0015 12
131	94403	1914996 (205200)	NEWCASTLE TOWN (DARL CON 03 031	17 676915 4865624 L	2000/04 1455	6	FR	15/110/7/2:0	DO	0127 8
132	94714	1915376 (234003)	NEWCASTLE TOWN (DARL CON 03 031	17 676914 4865623 L	2001/09 3136	6	FR 0222	51/235/10/1:0	DO	0229 10
133	94715	1915377 (234004) A	NEWCASTLE TOWN (DARL CON 03 031	17 676914 4865623 L	2001/09 3136					
134	94875	1915487 (229281)	NEWCASTLE TOWN (DARL CON 03 033	17 676131 4865360 L	2001/12 6874	30	FR 0030	6/30/25/2:0	DO	
135	95044	1915668 (235841)	NEWCASTLE TOWN (DARL CON 03 031	17 676914 4865623 L	2001/12 1673	6	UK 0050	6/30/29/2:0	DO	0045 5
136	95189	1915855 (245772)	NEWCASTLE TOWN (DARL CON 03 033	17 676131 4865360 L	2002/06 6874	30	FR 0020	10/36/25/2:0	DO	
137	95194	1915860 (245768)	NEWCASTLE TOWN (DARL CON 03 029	17 677704 4865893 L	2002/05 6874	30	FR 0020	5/20/25/2:0	DO	
138	95270	1915941 (245835)	NEWCASTLE TOWN (DARL CON 03 031	17 676914 4865623 L	2002/07 6874	30	FR 0020	5/20/25/2:0	DO	
139	95309	1915983 (245802)	NEWCASTLE TOWN (DARL CON 03 029	17 677703 4865892 L	2002/08 6874	30	FR	10/27/25/4:0	DO	
140	95520	1916219 (252963)	NEWCASTLE TOWN (DARL CON 03 029	17 677703 4865892 L	2002/11 6874	36	FR 0009	9/20/25/2:0	DO	
141	95540	1916248 (251278)	NEWCASTLE TOWN (DARL CON 03 033	17 676130 4865360 L	2002/12 2214	24 18	FR 0030 FR 0038	6/40//17:0	DO	
142	95701	1916421 (252987)	NEWCASTLE TOWN (DARL CON 03 029	17 677704 4865893 L	2003/04 6874	30	FR 0017	4/17/25/1:0	DO	
143	96080	1916861 (Z03867) _NO_TAG	NEWCASTLE TOWN (DARL CON 03 031	17 676914 4865623 L	2003/01 1413	6.25	FR 0135	/120/35/2:0	IR	0122 12
144	96420	1917269 (Z06822) A	NEWCASTLE TOWN (DARL CON 03 031	17 676518 4866289 W	2004/08 1413	30		2///:		
145	96421	1917270 (Z06821) A	NEWCASTLE TOWN (DARL CON 03 031	17 676515 4866306 W	2004/08 1413	36		2///:		
146	96422	1917271 (Z06820) A	NEWCASTLE TOWN (DARL CON 03 031	17 676515 4866306 W	2004/08 1413	30		9///:		
147	96448	1917305 (Z19243) A	NEWCASTLE TOWN (DARL CON 03 031	17 676514 4866235 W	2004/10 1413	30		4///:		
148	96512	1917377 (Z12717) A012650	NEWCASTLE TOWN (DARL CON 03 028	17 677521 4867033 W	2004/08 3136	5.98	FR 0178	20/42/13/1:	DO	
149	97233	1918197 (Z42598) A	NEWCASTLE TOWN (DARL CON 04 010	17 675976 4866617 W	2006/03 3136					

FID	WELL TAG AUDIT	TOWNSHIP CON LOT	TOWNSHIP_C	DATE CNTR	CASING DIA	CASING_DIA	PUMP TEST	WELLS USE	WELLS_USE	SCREEN
150	97461	1918452 (Z43544) A039173	NEWCASTLE TOWN (DARL 04 031	17 676604 4867149 W	2006/07 7067	6.26	FR 0171	20/24/7/1:0	DO	
151	567827	7042589 (Z36142) A033006	NEWCASTLE TOWN (DARL 03 018	17 676029 4865727 W	2006/01 1455	6.26		8/42/5/1:0	DO	0062 3
152	602084	7123561 (Z55127) A	NEWCASTLE TOWN (DARL CON 03 028	17 677505 4867001 W	2009/04 3136					
153	602087	7123564 (Z42625) A052397	NEWCASTLE TOWN (DARL CON 03 028	17 677509 4867002 W	2009/04 3136	6.3	FR 0178	20/70/10/1:	DO	
154	634759	7156159 (Z117971) A098476 A	NEWCASTLE TOWN (DARL CON 03 031	17 676638 4866444 W	2010/07 2662					
155	646221	7168903 (Z123349) A103199	NEWCASTLE TOWN (DARL CON 03 031	17 676976 4865978 W	2011/06 7067	6.26	FR 0095	8/20/3/:	DO	0097 4
156	650557	7173649 (M10298) A092581 P	NEWCASTLE TOWN (DARL	17 676284 4865385 W	2010/07 6809					
157	656344	7180099 (Z140803) A	NEWCASTLE TOWN (DARL CON 03 028	17 677923 4865580 W	2012/02 1413	36		4///:		
158	664974	7189769 (Z154114) A132718	NEWCASTLE TOWN (DARL CON 04 030	17 677090 4866868 W	2012/08 1413	6.25	FR 0039	10/30/20/1:	DO	0036 3
159	680285	7207009 (Z172628) A134891	NEWCASTLE TOWN (DARL CON 03 031	17 676444 4866356 W	2013/07 1413	6.25 5.5		19/130/40/8:	IR	0128 11 0139 11
160	684135	7211173 (Z166405) A144389	NEWCASTLE TOWN (DARL	17 676415 4865180 W	2013/07 7247	2	UT 0015		MT	0015 5
161	711501	7241045 (Z208515) A055151	NEWCASTLE TOWN (DARL	17 677580 4866701 W	2015/04 7362	6	UT 0028	12/19/10/1:	DO OT	0030 4
162	711836	7241358 (Z208516) A	NEWCASTLE TOWN (DARL CON 03 029	17 677557 4866706 W	2015/04 7362		UT		OT	
163	711837	7241359 (Z208517) A	NEWCASTLE TOWN (DARL CON 03 029	17 677561 4866709 W	2015/04 7362				OT	
164	715638	7245453 (Z187346) A	NEWCASTLE TOWN (DARL CON 03 031	17 677109 4865662 W	2015/03 7067	30 6		17///:	DO	0107 3
165	748835	7280413 (Z248723) A211123 A	NEWCASTLE TOWN (DARL CON 03 028	17 677986 4865755 W	2016/11 2662					
166	763510	7295337 (Z256352) A211151 A	NEWCASTLE TOWN (DARL CON 03 033	17 676252 4865111 W	2017/05 2662					
167	786581	7319181 (Z290944) A250539	NEWCASTLE TOWN (DARL CON 04 031	17 676318 4867040 W	2018/08 1413	6.25	FR 0117	15/98/15/1:	DO	0112 5
168	786583	7319183 (Z290945) A	NEWCASTLE TOWN (DARL CON 04 031	17 676316 4867042 W	2018/08 1413	6.25		15///:		
169	813670	7347417 (Z312464) A	NEWCASTLE TOWN (DARL CON 03 033	17 676256 4864963 W	2019/09 7560	24 36	UT 0043	19///:	DO	
170	822064	7355912 (Z314444) A271490	NEWCASTLE TOWN (DARL	17 675959 4865978 W	2020/01 1413	6.25	FR 0095	9/69/12/1:	DO	0090 5 0088 2
171	822090	7355939 (Z317744) A265177	NEWCASTLE TOWN (DARL	17 676090 4865045 W	2019/07 7247	2	UT 0015		MT	0020 5
172	829733	7364037 (Z338570) A296392 P	NEWCASTLE TOWN (DARL	17 677283 4865233 W	2020/07 7472					
173	842110	7376732 (Z329958) A301857 P	NEWCASTLE TOWN (DARL CON 03 033	17 676101 4865816 W	2020/09 1413					
174	850815	7385572 (Z349849) A288093 P	NEWCASTLE TOWN (DARL CON 03 029	17 677382 4866715 W	2021/04 7329					

FID	WELL TAG AUDIT	TOWNSHIP CON LOT	TOWNSHIP_C	DATE CNTR	CASING DIA	CASING_DIA	PUMP TEST	WELLS USE	WELLS_USE	SCREEN
175	853410	7388247 (Z352986) A231187 P	NEWCASTLE TOWN (DARL CON 03 033	17 676043 4865749 W	2021/05 5459					
176	869348	7404536 (Z361042) A310123 P	NEWCASTLE TOWN (DARL CON 04 030	17 676858 4866735 W	2021/10 1413					

Wells Total

Count: 177

Date Exported: 11/18/2024 9:36 AM

TOWNSHIP CON LOT UTM DATE CNTR CASING DIA WATER PUMP TEST WELL USE SCREEN WELL FORMATION

Notes:
UTM: UTM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid
DATE CNTR: Date Work Completedand Well Contractor Licence Number
CASING DIA: .Casing diameter in inches
WATER: Unit of Depth in Fee. See Table 4 for Meaning of Code

PUMP TEST: Static Water Level in Feet / Water Level After Pumping in Feet / Pump Test Rate in GPM / Pump Test Duration in Hour : Minutes
WELL USE: See Table 3 for Meaning of Code
SCREEN: Screen Depth and Length in feet
WELL: WEL (AUDIT #) Well Tag . A: Abandonment; P: Partial Data Entry Only
FORMATION: See Table 1 and 2 for Meaning of Code

1. Core Material and Descriptive terms

Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
BLDR	BOULDERS	FCRD	FRACTURED	IRFM	IRON FORMATION	PORS	POROUS	SOFT	SOFT
BSLT	BASALT	FGRD	FINE-GRAINED	LIMY	LIMY	PRDG	PREVIOUSLY DUG	SPST	SOAPSTONE
CGRD	COARSE-GRAINED	FGVL	FINE GRAVEL	LMSN	LIMESTONE	PRDR	PREV. DRILLED	STKY	STICKY
CGVL	COARSE GRAVEL	FILL	FILL	LOAM	TOPSOIL	QRTZ	QUARTZITE	STNS	STONES
CHRT	CHERT	FLDS	FELDSPAR	LOOS	LOOSE	QSND	QUICKSAND	STNY	STONEY
CLAY	CLAY	FLNT	FLINT	LTCL	LIGHT-COLOURED	QTZ	QUARTZ	THIK	THICK
CLN	CLEAN	FOSS	FOSILIFEROUS	LYRD	LAYERED	ROCK	ROCK	THIN	THIN
CLYY	CLAYEY	FSND	FINE SAND	MARL	MARL	SAND	SAND	TILL	TILL
CMTD	CEMENTED	GNIS	GNEISS	MGRD	MEDIUM-GRAINED	SHLE	SHALE	UNKN	UNKNOWN TYPE
CONG	CONGLOMERATE	GRNT	GRANITE	MGVL	MEDIUM GRAVEL	SHLY	SHALY	VERY	VERY
CRYS	CRYSTALLINE	GRSN	GREENSTONE	MRBL	MARBLE	SHRP	SHARP	WBRG	WATER-BEARING
CSND	COARSE SAND	GRVL	GRAVEL	MSND	MEDIUM SAND	SHST	SCHIST	WDFR	WOOD FRAGMENTS
DKCL	DARK-COLOURED	GRWK	GREYWACKE	MUCK	MUCK	SILT	SILT	WTHD	WEATHERED
DLMT	DOLOMITE	GVLY	GRAVELLY	OBDN	OVERBURDEN	SLTE	SLATE		
DNSE	DENSE	GYPS	GYPSUM	PCKD	PACKED	SLTY	SILTY		
DRTY	DIRTY	HARD	HARD	PEAT	PEAT	SNDS	SANDSTONE		
DRY	DRY	HPAN	HARDPAN	PGVL	PEA GRAVEL	SNDY	SANDYOAPSTONE		

2. Core Color

Code	Description
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GREN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLCK	BLACK
BLGY	BLUE-GREY

3. Well Use

Code	Description	Code	Description
DO	Domestic	OT	Other
ST	Livestock	TH	Test Hole
IR	Irrigation	DE	Dewatering
IN	Industrial	MO	Monitoring
CO	Commercial	MT	Monitoring TestHole
MN	Municipal		
PS	Public		
AC	Cooling And A/C		
NU	Not Used		

4. Water Detail

Code	Description	Code	Description
FR	Fresh	GS	Gas
SA	Salty	IR	Iron
SU	Sulphur		
MN	Mineral		
UK	Unknown		

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix B

Borehole Logs

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH24-1

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4866304.29 E 676659.37

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Aug-22-2024

REF. NO.: 23-469-100
ENCL NO.: 2

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
145.8					
145.8 0.0	**TOPSOIL:** 250mm				
0.3	**REWORKED SAND:** trace topsoil, trace rootlets, trace organics, dark brown, wet, very loose (weathered/disturbed)	1	SS	3	
145.0 0.8	**SAND:** trace silt, trace clay, brown, wet, compact	2	SS	12	145
144.3 1.5	**SILTY SAND TILL:** trace clay, trace gravel, trace cobble/boulder, brown, moist to very moist, very dense	3	SS	57	144
		4	SS	58	143
142.8 3.0	**SAND TO SILTY SAND:** trace clay, occasional gravel, brown, wet, dense to very dense	5	SS	30	142
		6	SS	63	141
139.4 6.4	**END OF BOREHOLE:**	7	SS	50/ 130mm	140

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date: Water Level(mbgl):
Sept. 11, 2024 1.0

W. L. 144.8 m
Sep 11, 2024

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
1	59	38	2

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-10-1

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH24-2

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4866006.33 E 676560.29

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Aug-22-2024

REF. NO.: 23-469-100
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
143.6												
143.3 0.0	**TOPSOIL:** 250mm											
0.3	**REWORKED SAND:** trace topsoil, trace rootlets, trace organics, dark brown, wet, compact		1	SS	13		143					
142.8	(weathered/disturbed)											
1 0.8	**SANDY SILT:** trace clay, brown, wet, compact		2	SS	19	W. L. 142.8 m Sep 11, 2024						
142.1							142					
1.5	**SAND:** trace silt, trace clay, brown, wet, dense		3	SS	41							
2												
141.0			4	SS	36		141					
2.6	**SANDY SILT:** trace clay, grey, wet, dense											
3 140.6												
3.0	**SANDY SILT TO SILTY SAND TILL:** trace to some clay, trace gravel, trace cobble/boulder, grey, wet, very dense		5	SS	75		140					
4												
139.0							139					
4.6	**CLAYEY SILT TILL:** sandy, trace gravel, occasional cobble, grey, very moist, stiff		6	SS	10							
5												
6 137.5							138					
6.1	**SANDY SILT TILL:** trace to some clay, trace gravel, trace cobble/boulder, grey, wet, dense		7	SS	38							
136.9							137					
6.7	**END OF BOREHOLE:**											

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date:	Water Level(mbgl):
Sept. 11, 2024	0.8

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-10-1

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH24-3

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4865915.49 E 676792.19

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Aug-23-2024

REF. NO.: 23-469-100
ENCL NO.: 4

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS / 0.3 m "N"
142.1 / 0.0	**TOPSOIL:** 250mm			
141.8 / 0.3	**REWORKED SAND:** trace topsoil, trace rootlets, trace organics, dark brown, wet, loose (weathered/disturbed)	1	SS	4
141.3 / 0.8	**SAND TO SILTY SAND:** trace clay, brown to grey, wet, compact to very dense	2	SS	24
		3	SS	65
		4	SS	56
		5	SS	54
137.3 / 4.8	**SANDY SILT:** trace clay, grey, wet, dense	6	SS	31
136.1 / 6.0	**SILTY CLAY TILL:** sandy, trace gravel, grey, moist, soft	7	SS	3
134.6 / 7.5	**SANDY SILT TO SILTY SAND:** trace clay, trace gravel, grey, wet, dense	8	SS	42
133.9 / 8.2	**END OF BOREHOLE:**			

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date:	Water Level(mbgl):
Sept. 11, 2024	0.2

GROUND WATER CONDITIONS: W. L. 141.9 m, Sep 11, 2024

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

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)	GR	SA	SI	CL
	2	40	39	19

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-4

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4865700.53 E 676701.17

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Aug-22-2024

REF. NO.: 23-469-100
ENCL NO.: 5

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
144.9								
0.0 / 144.8	**TOPSOIL:** 280mm							
0.3 / 144.1	**REWORKED SAND:** trace topsoil, trace rootlets, trace organics, dark brown, wet, very loose (weathered/disturbed)		1	SS	3			
0.8	**SANDY SILT TO SILT SAND:** trace clay, brown to grey, wet, compact to dense		2	SS	13	▽	144	W. L. 144.0 m Sep 11, 2024
			3	SS	37		143	
142.6								
2.3	**SILT TO SANDY SILT:** trace clay, seams of fine sand, grey, wet, compact to dense		4	SS	32		142	0 18 78 4
	180mm clayey silt layer at 3.1m		5	SS	23		141	
140.6								
4.3	**SILT:** trace sand, trace clay, grey, wet, loose		6	SS	8		140	
138.9								
6.0	**SILTY CLAY:** trace sand, grey, moist, very soft		7	SS	1		139	
			8	SS	1		138 137	0 3 41 56
135.9							136	
9.0	**SILTY CLAY TILL:** sandy, sand seams, trace gravel, grey, moist, firm		9	SS	4			
135.0							135	
9.9	**SANDY SILT TILL:** trace to some clay, trace gravel, grey, wet, compact		10	SS	21			
134.4								
10.5	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): Sept. 11, 2024 0.9							

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-10-1

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LOG OF BOREHOLE BH24-5D

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4866598 E 676609.05

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Jan-25-2024

REF. NO.: 23-469-100
ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
146.8												
146.6	**TOPSOIL:** 230mm											
0.2	**REWORKED SAND:** trace topsoil, trace rootlets, trace silt, dark brown, wet, loose (weathered/disturbed)		1	SS	4							
145.8							146					
1.0	**SAND:** trace silt, brown, wet, loose to compact		2	SS	6							
2			3	SS	15	▽	145					
144.5												
2.3	**SANDY SILT TO SILTY SAND TILL:** trace to some clay, trace gravel, occasional cobble, brown to grey, moist to wet, compact		4	SS	13		144					
3	grey below 3.1m		5	SS	14							
4							143					Auger grinding at 3.8m
5			6	SS	12		142					
6							141					
7			7	SS	16		140					
8			8	SS	12		139					5 47 37 11
9	wet, dense at 9.1m		9	SS	36		138					
137.1												
9.7	**END OF BOREHOLE:**											

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date:	Water Level(mbgl):
Feb. 15, 2024	1.67

W.L 145.1 m Feb 15, 2024

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-3-14

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LOG OF BOREHOLE BH24-5S

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4866598 E 676609.05

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Jan-25-2024

REF. NO.: 23-469-100
ENCL NO.: 6S

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
146.8					
146.6 0.0	**TOPSOIL:** 230mm				
0.2 / 145.8	**REWORKED SAND:** trace topsoil, trace rootlets, trace silt, dark brown, wet, loose (weathered/disturbed)	1	SS	4	146
1.0 / 144.5	**SAND:** trace silt, brown, wet, loose to compact	2	SS	6	
		3	SS	15	145
2.3	**SANDY SILT TO SILTY SAND TILL:** trace to some clay, trace gravel, occasional cobble, brown to grey, moist to wet, compact	4	SS	13	144
	grey below 3.1m	5	SS	14	143
		6	SS	12	142
6.1 / 140.7	**END OF BOREHOLE:**				141

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date: Water Level(mbgl):
Feb. 15, 2024 1.45

GROUND WATER CONDITIONS: W. L. 145.3 m Feb 15, 2024

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

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)
REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-3-14

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LOG OF BOREHOLE BH24-6

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4866486.07 E 676779.36

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Jan-25-2024

REF. NO.: 23-469-100
ENCL NO.: 7

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
144.6 / 0.0	**TOPSOIL:** 250mm				
144.4 / 0.3	**REWORKED SAND:** trace topsoil, trace rootlets, trace organics, dark brown, wet, very loose	1	SS	3	
143.8 / 0.8	(weathered/disturbed) **SAND:** trace silt, brown, wet, compact to very dense	2	SS	12	
142.9 / 1.7	**SANDY SILT TO SILTY SAND TILL:** trace to some clay, trace gravel, trace cobble/boulder, grey, moist to very moist, compact to vey dense	3	SS	50/ 75mm	143
		4	SS	56	142
		5	SS	52	141
	some clay to clayey, some gravel at 4.6m	6	SS	13	140
137.9 / 6.7	**END OF BOREHOLE:**	7	SS	11	139 / 138

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date: Water Level(mbgl):
Feb. 15, 2024 0.51

GROUND WATER CONDITIONS: W1 144.1 m Feb 15, 2024

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

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

Auger grinding

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-3-14

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LOG OF BOREHOLE BH24-7

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4866443.1 E 676903.37

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Jan-24-2024

REF. NO.: 23-469-100
ENCL NO.: 8

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
144.6							
0.0 / 144.3	**TOPSOIL:** 280mm		1	SS	3		
0.3 / 143.6	**REWORKED SAND:** trace topsoil, trace organics, dark brown to brown, very moist to wet, very loose to compact (weathered/disturbed)		2	SS	14	▽ W. L. 143.3 m Feb 15, 2024	144
1.0	**SAND:** trace silt, trace gravel, brown, wet, compact to very dense		3	SS	18		143
2			4	SS	39		142
3 / 141.2			5	SS	50/ 130mm		
3.4	**SILT:** trace sand, trace clay, grey, wet, very dense						141
4 / 140.0							
4.6	**SILTY CLAY:** wet silty sand layer, grey, moist, stiff		6	SS	12		140
5 / 138.6							139
6.0 / 138.2	**SILTY SAND TILL:** trace clay, trace gravel, grey, very moist, very dense		7	SS	50/ 150mm		
6.4	**END OF BOREHOLE:**						

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date: Water Level(mbgl):
Feb. 15, 2024 1.25

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-3-14

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LOG OF BOREHOLE BH24-8

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4866548.24 E 677218.84

DRILLING DATA
Method: Solid Stem Auger/Hollow Stem
Diameter: 150/200mm
Date: Jan-22-2024

REF. NO.: 23-469-100
ENCL NO.: 9

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
145.9						
0.0 / 145.3	**TOPSOIL:** 800mm	1	SS	7		
0.6 / 145.0	**REWORKED SAND:** trace organics, dark brown to brown, wet, compact (weathered/disturbed)					
0.9	**SAND:** trace silt, trace gravel, brown to grey, wet, compact to very dense	2	SS	14	145	
		3	SS	13	144	
		4	SS	32	143	Switched to Hollow Stem
		5	SS	50	142	
	grey below 4.6m	6	SS	28	141	
		7	SS	30	140	
139.2						
6.7	**END OF BOREHOLE:**					

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date:	Water Level(mbgl):
Feb. 15, 2024	1.21

W. L. 144.7 m
Feb 15, 2024

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-3-14

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LOG OF BOREHOLE BH24-9

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4866223.65 E 676952.96

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Jan-24-2024

REF. NO.: 23-469-100
ENCL NO.: 10

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
142.9 / 0.0	**TOPSOIL:** 250mm				
142.7 / 0.3	**REWORKED SAND:** trace topsoil, trace rootlets, dark brown to brown, wet, loose to compact (weathered/disturbed)	1	SS	7	
141.9 / 1.0	**SAND:** trace silt, trace clay, brown to grey, wet, compact	2	SS	15	142
141.1 / 1.8	**CLAYEY SILT TO SILT:** trace sand, grey, moist to very moist, stiff	3	SS	14	141
140.5 / 2.4	**SAND:** trace silt, trace clay, brown, wet, compact to loose	4	SS	15	140
		5	SS	8	139
138.3 / 4.6	**SILTY CLAY:** trace to some sand, sand seams, grey, very moist, stiff	6	SS	12	138
136.9 / 6.0	**SILTY SAND TILL:** trace clay, trace gravel, trace cobble, grey, very moist, very dense	7	SS	50/ 150mm	137
136.7 / 6.2	**END OF BOREHOLE:**				

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date:	Water Level(mbgl):
Feb. 15, 2024	1.03

W. L. 141.9 m
Feb 15, 2024

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
0	10	52	38

Auger grinding

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-3-14

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LOG OF BOREHOLE BH24-10

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4866667.59 E 676801.68

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Jan-23-2024

REF. NO.: 23-469-100
ENCL NO.: 11

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS "N" / 0.3 m
146.2 / 0.0	**TOPSOIL:** 250mm			
0.3 / 145.2	**REWORKED SAND:** trace topsoil, trace rootlets, trace silt, dark brown to brown, wet, loose to compact (weathered/disturbed)	1	SS	7
1.0	**SAND:** trace silt, trace gravel, brown to grey, wet, compact to very dense	2	SS	14
		3	SS	18
	silt layer at 3.1m	4	SS	25
		5	SS	18
	grey below 4.6m	6	SS	50/75mm
6.0 / 140.2	**SILTY SAND TILL:** trace clay, trace gravel, grey, wet, dense	7	SS	32
6.7 / 139.5	**END OF BOREHOLE:**			

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date	Water Level (mbgl)
Feb. 15, 2024	1.2

GROUND WATER CONDITIONS: W.L. 145.0 m Feb 15, 2024

ELEVATION: 146, 145, 144, 143, 142, 141, 140

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

Auger grinding

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-3-14

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LOG OF BOREHOLE BH24-11

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4866749.99 E 677097.04

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Jan-22-2024

REF. NO.: 23-469-100
ENCL NO.: 12

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
147.9								
0.0 / 147.6	**TOPSOIL:** 300mm		1	SS	3		147	
0.3	**REWORKED SILTY SAND:** trace organics, trace topsoil, brown, moist, very loose (weathered/disturbed)		2	SS	3			
1.5 / 146.4	**SAND:** trace silt, trace gravel, trace clay, brown, wet, compact to dense		3	SS	18		146	
			4	SS	33	W. L. 145.6 m Feb 15, 2024	145	
			5	SS	24		144	
			6	SS	17		143	1 92 5 3
			7	SS	19		142	
141.2								
6.7	**END OF BOREHOLE:**							

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date:	Water Level(mbgl):
Feb. 15, 2024	2.36

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-12D

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4866268.79 E 677305.64

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Jan-22-2024

REF. NO.: 23-469-100
ENCL NO.: 13

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
144.0												
143.7 0.3	**TOPSOIL:** 250mm											
	REWORKED SAND: trace topsoil, trace rootlets, trace silt, dark brown to brown, wet, loose to compact (weathered/disturbed)		1	SS	4							
143.0 1.0	**SAND:** trace silt, trace gravel, brown to grey, wet, compact to very dense		2	SS	21	▽	143 W. L. 143.0 m Feb 15, 2024					
2			3	SS	25		142					
			4	SS	25							
3							141					
			5	SS	52							
4							140					
139.4 4.6	**SANDY SILT TILL:** trace to some clay, trace gravel, brown, wet, dense		6	SS	48		139					3 42 43 12
5												
6			7	SS	40		138					
7							137					
136.4 7.6	**SILT:** trace clay, trace sand, brown, wet, compact		8	SS	disturbed		136					
8												
9	some clay, grey at 9.1m						135					
			9	SS	17							
134.3 9.7	**END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water Level Readings: Date: Water Level(mbgl): Feb. 15, 2024 0.99											

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-3-14

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LOG OF BOREHOLE BH24-12S

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4866268.79 E 677305.64

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Jan-22-2024

REF. NO.: 23-469-100
ENCL NO.: 13S

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"
144.0 / 0.0	**TOPSOIL:** 250mm			
143.7 / 0.3	**REWORKED SAND:** trace topsoil, trace rootlets, trace silt, dark brown to brown, wet, loose to compact (weathered/disturbed)	1	SS	4
143.0 / 1.0	**SAND:** trace silt, trace gravel, brown to grey, wet, compact to very dense	2	SS	21
		3	SS	25
		4	SS	25
		5	SS	52
139.4 / 4.6	**SANDY SILT TILL:** trace to some clay, trace gravel, brown, wet, dense	6	SS	48
137.9 / 6.1	**END OF BOREHOLE:**			

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date:	Water Level(mbgl):
Feb. 15, 2024	0.90

W.L. 143.1 m Feb 15, 2024

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)
REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-13

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4866008.59 E 677221.1

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Jan-25-2024

REF. NO.: 23-469-100
ENCL NO.: 14

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"
140.6 / 0.0	**TOPSOIL:** 300mm			
140.3 / 0.3	**REWORKED SILTY SAND:** trace organics, trace topsoil, brown, wet, loose (weathered/disturbed)	1	SS	5
139.8 / 0.8	**SANDY SILT:** trace clay, brown, wet, compact	2	SS	14
139.1 / 1.5	**SAND:** trace silt, trace gravel, brown, wet, compact	3	SS	15
		4	SS	20
137.3 / 3.3	**SILTY SAND:** trace clay, grey, wet, compact	5	SS	15
136.0 / 4.6	**SILT:** trace sand, trace clay, grey, wet, compact	6	SS	19
	some clay at 6.1m	7	SS	11
133.9 / 6.7	**END OF BOREHOLE:**			

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date: Water Level(mbgl):
Feb. 15, 2024 0.42

GROUND WATER CONDITIONS: W_L 140.2 m Feb 15, 2024

ELEVATION: 140, 139, 138, 137, 136, 135, 134

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT W_P — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-3-14

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LOG OF BOREHOLE BH24-14

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4865916.57 E 677063.19

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Jan-24-2024

REF. NO.: 23-469-100
ENCL NO.: 15

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
140.3							
0.0 / 140.0	**TOPSOIL:** 300mm		1	SS	6		140
0.3 / 139.3	**REWORKED SAND:** trace organics, trace topsoil, brown, wet, loose (weathered/disturbed)					W. L. 139.7 m Feb 15, 2024	
1.0 / 138.0	**SILT:** trace sand, trace clay, brown, wet, compact		2	SS	15		139
			3	SS	18		
2.3 / 137.3	**SILTY SAND:** trace clay, grey, wet, compact		4	SS	20		138
3.0 / 134.3	**SAND:** trace silt, trace gravel, brown, wet, compact		5	SS	18		137
			6	SS	11		136
6.0 / 133.6	**SILT TO CLAYEY SILT:** trace sand, grey, wet, compact		7	SS	10		135
							134
6.7	**END OF BOREHOLE:**						

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date: Water Level(mbgl):
Feb. 15, 2024 0.54

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-3-14

DS CONSULTANTS LTD.
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LOG OF BOREHOLE BH24-15

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Farewell Heights Landowners Group Inc.
PROJECT LOCATION: Fairwell Heights, Courtice, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4865733.15 E 677175.19

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Jan-24-2024

REF. NO.: 23-469-100
ENCL NO.: 16

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
139.1							139
0.0 / 138.8	**TOPSOIL:** 300mm		1	SS	7		
0.3 / 138.1	**REWORKED SAND:** trace organics, trace topsoil, brown, wet, loose (weathered/disturbed)		2	SS	10		138
1.0 / 137.6	**SANDY SILT:** trace clay, brown, moist, compact					W. L. 137.8 m Feb 15, 2024	
1.5	**SILTY SAND TO SANDY SILT TILL:** trace to some clay, trace gravel, grey, moist, compact		3	SS	18		137
			4	SS	18		
	some clay to clayey at 3.1m		5	SS	11		136
			6	SS	18		135
	wet gravelly sand at 6.1m						134
132.7			7	SS	14		133
6.4 / 132.4	**SAND:** some silt, trace clay, grey, ~~wet, compact~~						
6.7	**END OF BOREHOLE:**						

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water Level Readings:

Date:	Water Level(mbgl):
Feb. 15, 2024	1.35

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

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

DS SOIL LOG-2021-FINAL 23-469-100GEO.GPJ DS.GDT 24-3-14

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

Job Number: 1611-S079

LOG OF BOREHOLE NO.: 1

Figure No.: 1

Project Description: Proposed Land Acquisition

Job Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Method of Boring: Flight-Auger/HS

Drilling Date: December 5, 2016

Elevation (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
146.8	Ground Surface			
0.0	25 cm **TOPSOIL**	1	DO	21
	Brown, compact to very dense			
		2	DO	38
	FINE TO MEDIUM SAND some silt			
		3	DO	40
		4	DO	50/15
143.9				
2.9	Compact to dense	5	DO	42
	SANDY SILT			
	brown / grey		DO	22
141.0				
5.8	Grey, stiff	7	DO	14
	SILTY CLAY			
140.2				
6.6	END OF BOREHOLE			
	Installed 50 mm Ø standpipe to 6.0 m. Mounted with a steel protective casing.			

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10

Dynamic Cone (blows/30cm): 20 40 60 80

Shear Strength (kN/m^2): 50 100 150 200

Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL ▷ LL ◁

Moisture Content (%): 10 30 50 70 90

Moisture values: 14, 9, 21, 23, 1, 14, 23

Water Level: W.L. @ El. 145.9 m on completion

SOIL ENGINEERS LTD.

Job Number: 1611-S079

LOG OF BOREHOLE NO.: 2

Figure No.: 2

Project Description: Proposed Land Acquisition

Job Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Method of Boring: Flight-Auger/HS

Drilling Date: December 6, 2016

Elevation (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
147.1	Ground Surface				
0.0	30 cm **TOPSOIL**	1	DO	6	0
	Brown, loose to very dense weathered				
		2	DO	22	1
		3	DO	25	2
	FINE TO MEDIUM SAND some silt	4	DO	50/15	
		5	DO	82	3
143.1					
4.0	Brown, very dense				4
		6	DO	50/15	5
	SANDY SILT				
140.6		7	DO	50/15	6
6.5	END OF BOREHOLE				7
					8
					9
					10

Dynamic Cone (blows/30cm): 20 40 60 80

Shear Strength (kN/m^2): 50 100 150 200

Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL ▷ LL ◁

Moisture Content (%): 10 30 50 70 90

Moisture Content values: 14, 10, 19, 18, 16, 18, 14

Water Level: W.L. @ El. 145.3 m and Cave-in @ El. 146.2 m on completion

SOIL ENGINEERS LTD.

Job Number: 1611-S079

LOG OF BOREHOLE NO.: 3

Figure No.: 3

Project Description: Proposed Land Acquisition

Job Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Method of Boring: Flight-Auger/HS

Drilling Date: December 6, 2016

Elevation (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30cm) 20 40 60 80 / Shear Strength (kN/m^2) 50 100 150 200 / Penetration Resistance (blows/30cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 30 50 70 90	Water Level
147.5	Ground Surface							
0.0	20 cm **TOPSOIL**	1	DO	4	0		11	
	Brown, loose to very dense weathered	2	DO	19	1		8	
		3	DO	22	2		15	
		4	DO	50/15			20	
	FINE TO MEDIUM SAND some silt	5	DO	50/15	3		19	
		6	DO	50/15	4		15	
141.0		7	DO	50/15	5		15	
6.5	END OF BOREHOLE				6			
	Installed 50 mm Ø standpipe to 6.0 m. Mounted with a steel protective casing.				7			
					8			
					9			
					10			

W.L. @ El. 145.7 m on completion

SOIL ENGINEERS LTD.

Job Number: 1611-S079

LOG OF BOREHOLE NO.: 4

Figure No.: 4

Project Description: Proposed Land Acquisition

Job Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Method of Boring: Flight-Auger/HS

Drilling Date: December 5, 2016

Elevation (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
145.6	Ground Surface			
0.0	25 cm **TOPSOIL**			
	Brown, loose to very dense	1	DO	8
	weathered			
		2	DO	18
	FINE TO MEDIUM SAND some silt			
		3	DO	28
		4	DO	82
142.7				
2.9	Grey, very dense			
	SILT	5	DO	58
141.6				
4.0	Grey, compact			
	FINE TO MEDIUM SAND	6	DO	28
139.8				
5.8	Grey, very stiff			
	SILTY CLAY	7	DO	20
139.0				
6.6	END OF BOREHOLE			

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10

Dynamic Cone (blows/30cm): 20 40 60 80

Shear Strength (kN/m^2): 50 100 150 200

Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL ▷ LL ◁

Moisture Content (%): 10 30 50 70 90

Moisture Content values: 36, 19, 20, 18, 16, 17, 16

Water Level: W.L. @ El. 144.7 m and Cave-in @ El. 144.7 m on completion

SOIL ENGINEERS LTD.

Job Number: 1611-S079

LOG OF BOREHOLE NO.: 5

Figure No.: 5

Project Description: Proposed Land Acquisition

Job Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Method of Boring: Flight-Auger/HS

Drilling Date: December 5, 2016

Elevation (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
146.3	Ground Surface				
0.0	25 cm **TOPSOIL**	1	DO	6	0
	Brown, loose to very dense weathered				
		2	DO	30	1
		3	DO	28	2
	FINE TO MEDIUM SAND some silt				
		4	DO	42	3
		5	DO	86	4
		6	DO	56	5
141.3					
5.0	END OF BOREHOLE				6 7 8 9 10

Dynamic Cone (blows/30cm) 20 40 60 80

× Shear Strength (kN/m^2) 50 100 150 200

○ Penetration Resistance (blows/30cm) 10 30 50 70 90

Atterberg Limits PL ▷ LL ◁

● Moisture Content (%) 10 30 50 70 90

13 19 19 20 19 15

Water Level ▽ = W.L. @ El. 145.1 m and Cave-in @ El. 144.8 m on completion

Job Number: 1611-S079

LOG OF BOREHOLE NO.: 6

Figure No.: 6

Project Description: Proposed Land Acquisition

Job Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Method of Boring: Flight-Auger/HS

Drilling Date: December 5, 2016

Elevation (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
146.4	Ground Surface			
0.0	25 cm **TOPSOIL**	1	DO	5
	Brown, loose to very dense weathered			
		2	DO	26
		3	DO	36
	FINE TO MEDIUM SAND some silt	4	DO	80
		5	DO	50/15
		6	DO	70
140.6				
5.8	Brown, very dense			
139.9	**FINE TO COARSE SAND**	7	DO	50/15
6.5	END OF BOREHOLE			

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10

Dynamic Cone (blows/30cm): 20 40 60 80

Shear Strength (kN/m^2): 50 100 150 200

Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL ▷ LL ◁

Moisture Content (%): 10 30 50 70 90

Moisture Content values: 23, 19, 17, 19, 18, 17, 15

Water Level: ▽ = W.L. @ El. 145.2 m and Cave-in @ El. 144.9 m on completion

Job Number: 1611-S079

LOG OF BOREHOLE NO.: 7

Figure No.: 7

Project Description: Proposed Land Acquisition

Job Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Method of Boring: Flight-Auger/HS

Drilling Date: December 6, 2016

Elevation (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
145.0	Ground Surface				
0.0	20 cm **TOPSOIL**	1	DO	7	0
	Brown, loose to compact weathered				
		2	DO	20	1
	FINE SAND some silt				
		3	DO	21	2
142.9					
2.1	Grey, compact to very dense				
		4	DO	52	3
	SILT	5	DO	26	
					4
		6	DO	76	
140.0					5
5.0	END OF BOREHOLE				6
					7
					8
					9
					10

Dynamic Cone (blows/30cm): 20 40 60 80

Shear Strength (kN/m^2): 50 100 150 200

Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL ▷ LL ◁

Moisture Content (%): 10 30 50 70 90

Moisture Content values: 34, 19, 17, 20, 17, 14

Water Level: W.L. @ El. 143.8 m and Cave-in @ El. 143.2 m on completion

SOIL ENGINEERS LTD.

Job Number: 1611-S079

LOG OF BOREHOLE NO.: 8

Figure No.: 8

Project Description: Proposed Land Acquisition

Job Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Method of Boring: Flight-Auger/HS

Drilling Date: December 7, 2016

Elevation (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
145.2	Ground Surface				
0.0	30 cm **TOPSOIL**	1	DO	14	0
	Brown, compact to dense weathered				
		2	DO	28	1
	FINE TO MEDIUM SAND some silt				
		3	DO	42	2
142.7		4A	DO		
2.5 142.4	Brown, very dense **SILT**	4B	DO	56	
2.8	Brown, very stiff	5	DO	18	3
	SILTY CLAY				
141.2					4
4.0	Brown, dense	6	DO	38	
	FINE TO MEDIUM SAND some silt				5
139.4					
5.8	Brown, dense				6
	FINE TO COARSE SAND	7	DO	50	
138.6					
6.6	END OF BOREHOLE				7
	Installed 50 mm Ø standpipe to 6.0 m. Mounted with a steel protective casing.				8
					9
					10

Dynamic Cone (blows/30cm) 20 40 60 80

Shear Strength (kN/m^2) 50 100 150 200

Penetration Resistance (blows/30cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 30 50 70 90

33 20 18 19 19 18 16 13

Water Level

W.L. @ El. 144.6 m on completion

Job Number: 1611-S079

LOG OF BOREHOLE NO.: 9

Figure No.: 9

Project Description: Proposed Land Acquisition

Job Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Method of Boring: Flight-Auger/HS

Drilling Date: December 8, 2016

Elevation (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
145.4	Ground Surface			
0.0	25 cm **TOPSOIL**			
	Brown, loose to very dense	1	DO	8
	weathered			
	FINE TO MEDIUM SAND some silt	2	DO	30
		3	DO	62
143.3				
2.1	Brown, compact to very dense			
		4	DO	53
	SANDY SILT			
		5	DO	20
141.4				
4.0	Brown, dense			
	FINE TO MEDIUM SAND some silt	6	DO	40
140.4				
5.0	END OF BOREHOLE			

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10

Dynamic Cone (blows/30cm): 20 40 60 80

Shear Strength (kN/m^2): 50 100 150 200

Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL ▷ LL ◁

Moisture Content (%): 10 30 50 70 90

Moisture Content values: 25, 23, 17, 16, 20, 18

Water Level: W.L. @ El. 144.8 m and Cave-in @ El. 143.9 m on completion

Job Number: 1611-S079

LOG OF BOREHOLE NO.: 10

Figure No.: 10

Project Description: Proposed Land Acquisition

Job Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Method of Boring: Flight-Auger/HS

Drilling Date: December 7, 2016

Elevation (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
144.1	Ground Surface				
0.0	25 cm **TOPSOIL**	1	DO	20	0
	Brown, compact **FINE TO MEDIUM SAND**	2	DO	20	1
142.7					
1.4	Brown, compact **SILT**	3	DO	25	2
142.0					
2.1	Brown, compact **FINE TO MEDIUM SAND** some silt	4	DO	20	3
		5	DO	26	
		6	DO	24	4
					5
137.8		7A	DO		6
6.3 137.5	Grey, firm **SILTY CLAY**	7B	DO	8	
6.6	END OF BOREHOLE				7
	Installed 50 mm Ø standpipe to 6.0 m. Mounted with a steel protective casing.				8
					9
					10

Dynamic Cone (blows/30cm): 20 40 60 80

Shear Strength (kN/m^2): 50 100 150 200

Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL ▷ LL ◁

Moisture Content (%): 10 30 50 70 90

Moisture Content values: 31, 21, 21, 20, 22, 17, 14, 25

Water Level: W.L. @ El. 143.5 m on completion

SOIL ENGINEERS LTD.

Job Number: 1611-S079

LOG OF BOREHOLE NO.: 11

Figure No.: 11

Project Description: Proposed Land Acquisition

Job Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Method of Boring: Flight-Auger/HS

Drilling Date: December 7, 2016

Elevation (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
144.3	Ground Surface			
0.0	25 cm **TOPSOIL**	1	DO	6
	Brown, loose to compact weathered			
	FINE TO MEDIUM SAND some silt	2	DO	18
		3	DO	22
142.2				
2.1	Brown, compact			
	SILT	4	DO	15
141.4				
2.9	Brown, compact			
	FINE TO MEDIUM SAND some silt	5	DO	26
140.3				
4.0	Brown, dense			
	FINE TO COARSE SAND	6	DO	36
139.3				
5.0	END OF BOREHOLE			

Depth Scale (m): 0 1 2 3 4 5 6 7 8 9 10

Dynamic Cone (blows/30cm): 20 40 60 80

Shear Strength (kN/m^2): 50 100 150 200

Penetration Resistance (blows/30cm): 10 30 50 70 90

Atterberg Limits: PL ▷ LL ◁

Moisture Content (%): 10 30 50 70 90

Moisture content values: 21, 19, 20, 21, 18, 12

Water Level: ▽ W.L. @ El. 143.7 m and Cave-in @ El. 143.1 m on completion

Job Number: 1611-S079

LOG OF BOREHOLE NO.: 12

Figure No.: 12

Project Description: Proposed Land Acquisition

Job Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Method of Boring: Flight-Auger/HS

Drilling Date: December 8, 2016

Elevation (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
	30 cm **TOPSOIL** with wood and root debris		DO	1
	Brown, compact weathered			
	FINE TO MEDIUM SAND some silt	2	DO	22
		3	DO	22
142.3				
2.1	**SILT**	4	DO	34
2.9	Brown, compact to very dense	5	DO	54
	FINE TO MEDIUM SAND some silt	6	DO	18
138.1			DO	50/15
6.3	END OF BOREHOLE			
	Installed 50 mm Ø standpipe to 6.0 m. Mounted with a steel protective casing.			

Depth Scale (m): 2, 3, 4, 5, 6, 7, 8, 9, 10

Penetration Resistance (blows/30cm): 30 50 70 80

Atterberg Limits: PL ◁ LL ▷

Moisture Content (%): 10 30 50 70 90

Moisture Content values: 21, 20, 20, 17, 17, 17, 14

Water Level: W.L. @ El. 143.8 m on completion

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BURNSIDE

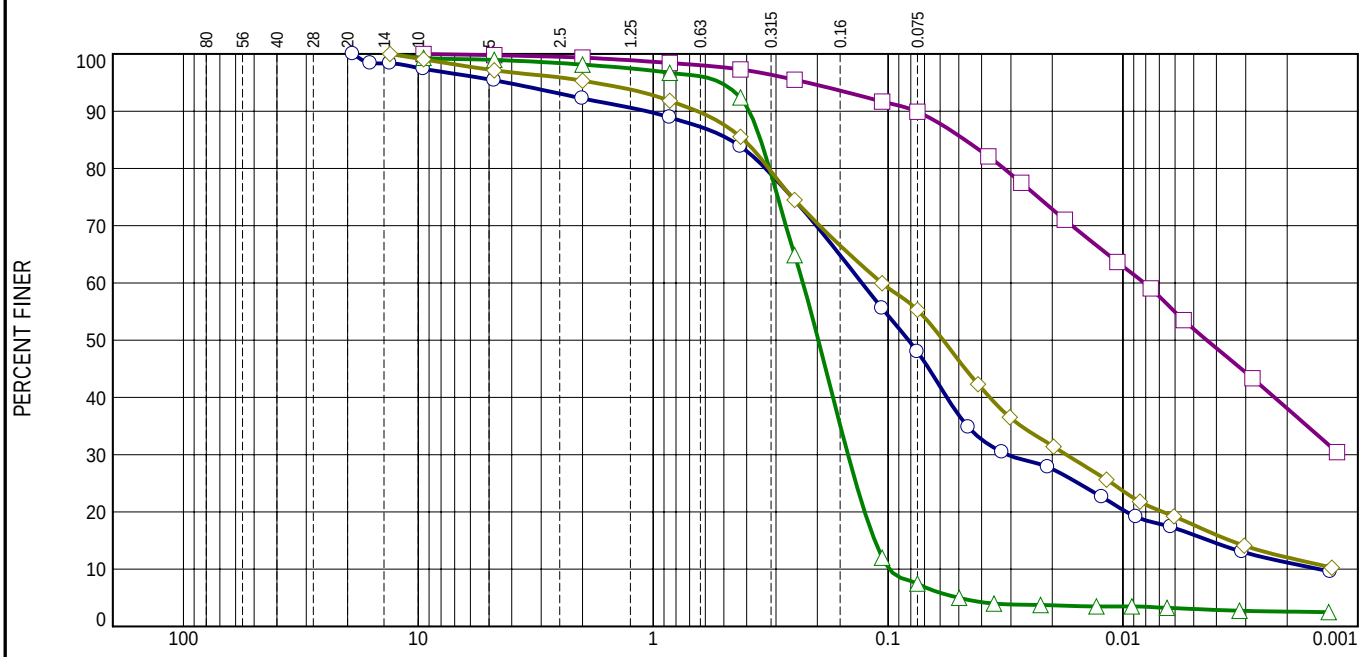
[THE DIFFERENCE IS OUR PEOPLE]

Appendix C

Hydraulic Conductivity

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	4.6	3.2	8.3	35.9	36.8	11.2
□	0.0	0.0	0.2	0.4	2.1	7.4	51.8	38.1
△	0.0	0.0	1.0	0.9	5.7	84.9	4.9	2.6
◇	0.0	0.0	2.9	1.8	9.8	30.2	43.2	12.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.4702	0.1293	0.0818	0.0311	0.0043	0.0015	5.10	88.35
□	30.8	12.5	0.0471	0.0081	0.0044					
△			0.3490	0.2305	0.1981	0.1482	0.1139	0.0990	0.96	2.33
◇			0.4108	0.1064	0.0582	0.0174	0.0035			

Material Description	USCS	AASHTO
○ Silty sand till, some clay, trace gravel □ Silty clay, trace sand, trace gravel △ Sand, trace silt, trace clay, trace gravel ◇ Sandy silt till, some clay, trace gravel	CL	A-6(15)

Project No. 23-469-100 Client: Farewell Heights Landowners Group Inc.

Project: Preliminary Geotechnical Investigation, Trulls Road and Pebblestone Road, Courtice.

○Location: BH24-5D SS8 Sample Number: VM-5059

□Location: BH24-9 SS6 Sample Number: VM-5059

△Location: BH24-11 SS6 Sample Number: VM-5059

◇Location: BH24-12D SS6 Sample Number: VM-5059

Remarks:

○F.M.=0.96

□F.M.=0.14

△F.M.=1.03

◇F.M.=0.81

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Geotechnical ❖ Environmental ❖ Materials ❖ Hydrogeology

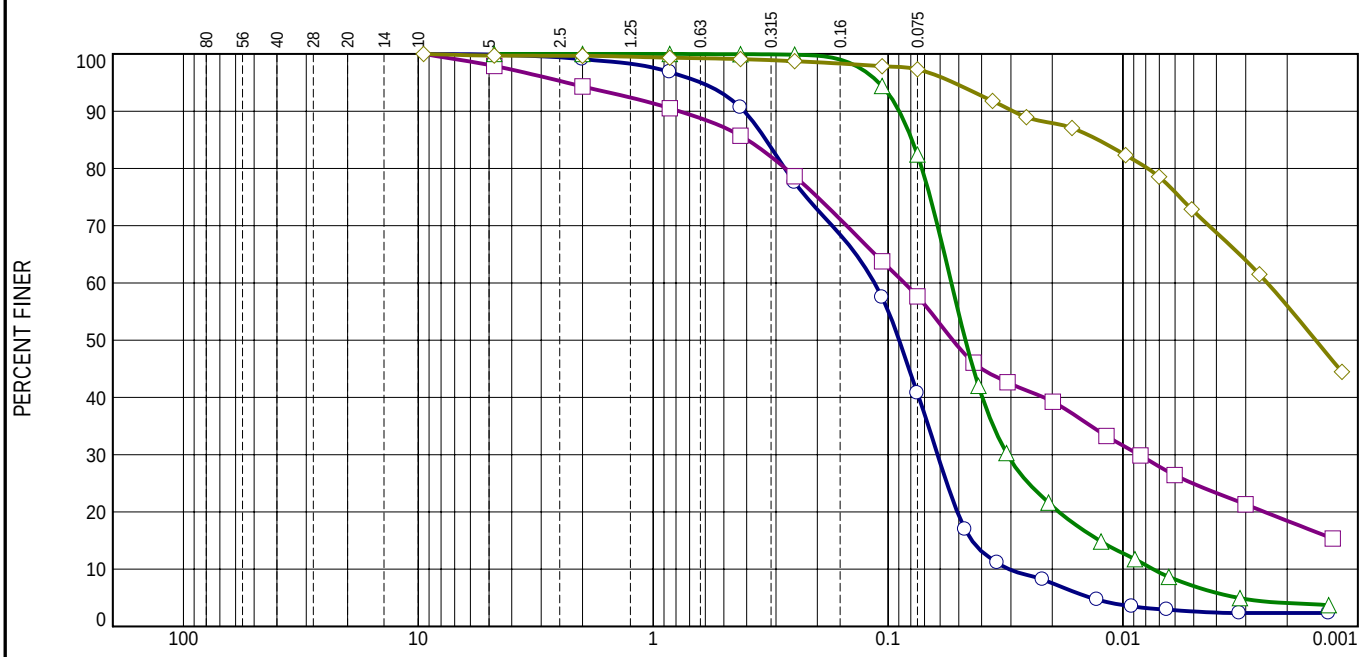
CCIL

Figure 17

Tested By: Helen/Nisha Checked By: S.Kirupa

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.1	0.8	8.4	50.0	38.4	2.3
□	0.0	0.0	2.1	3.6	8.6	28.1	39.1	18.5
△	0.0	0.0	0.0	0.0	0.1	17.5	78.3	4.1
◇	0.0	0.0	0.3	0.0	0.6	1.8	41.3	56.0

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.3310	0.1142	0.0897	0.0616	0.0440	0.0306	1.08	3.73
□	18	9	0.3975	0.0852	0.0530	0.0085				
△			0.0791	0.0538	0.0468	0.0310	0.0126	0.0074	2.41	7.23
◇	40	16	0.0128	0.0024	0.0015					

Material Description	USCS	AASHTO
○ Silty sand, trace clay, trace gravel		
□ Silty clay till, sandy, trace gravel	CL	A-4(2)
△ Silt, some sand, trace clay		
◇ Silty clay, trace sand, trace gravel	CL	A-6(24)

Project No. 23-469-100 Client: Farewell Heights Landowners Group Inc

Project: Fairwell Heights, Courtice, ON

○ Location: BH24-1 SS6 Sample Number: VM-5864

□ Location: BH24-3 SS7 Sample Number: VM-5864

△ Location: BH24-4 SS4 Sample Number: VM-5921

◇ Location: BH24-4 SS8 Sample Number: VM-5864

Remarks:

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Geotechnical ❖ Environmental ❖ Materials ❖ Hydrogeology

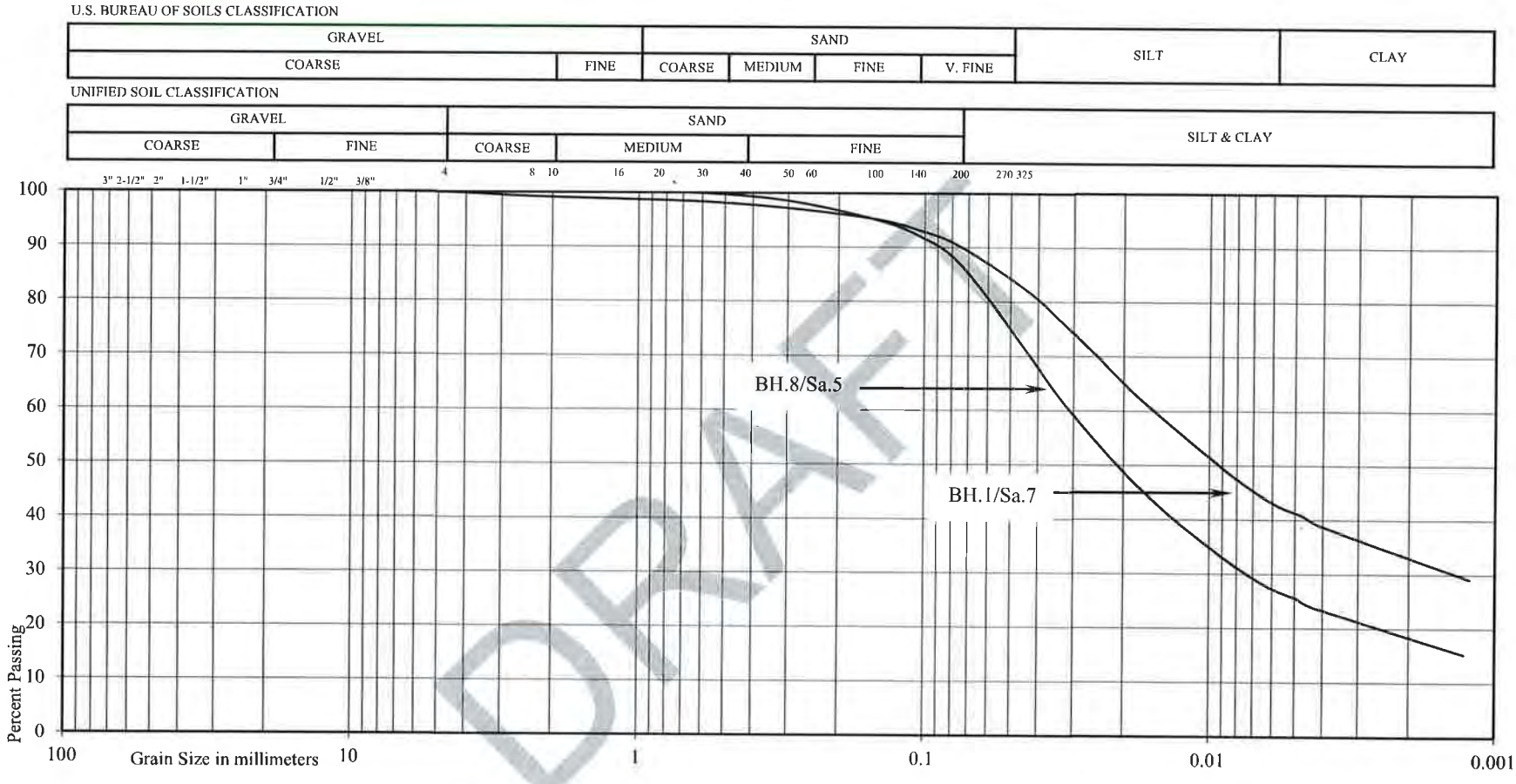
Figure 18

Tested By: Helen/Nisha Checked By: Kirupa

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1611-S079



Project: Proposed Land Acquisition

Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Borehole No:	1	8
Sample No:	7	5
Depth (m):	6.3	3.2
Elevation (m):	140.5	142.0

BH./Sa.	1/7	8/5
Liquid Limit (%) =	32	24
Plastic Limit (%) =	18	15
Plasticity Index (%) =	14	9
Moisture Content (%) =	23	18
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}

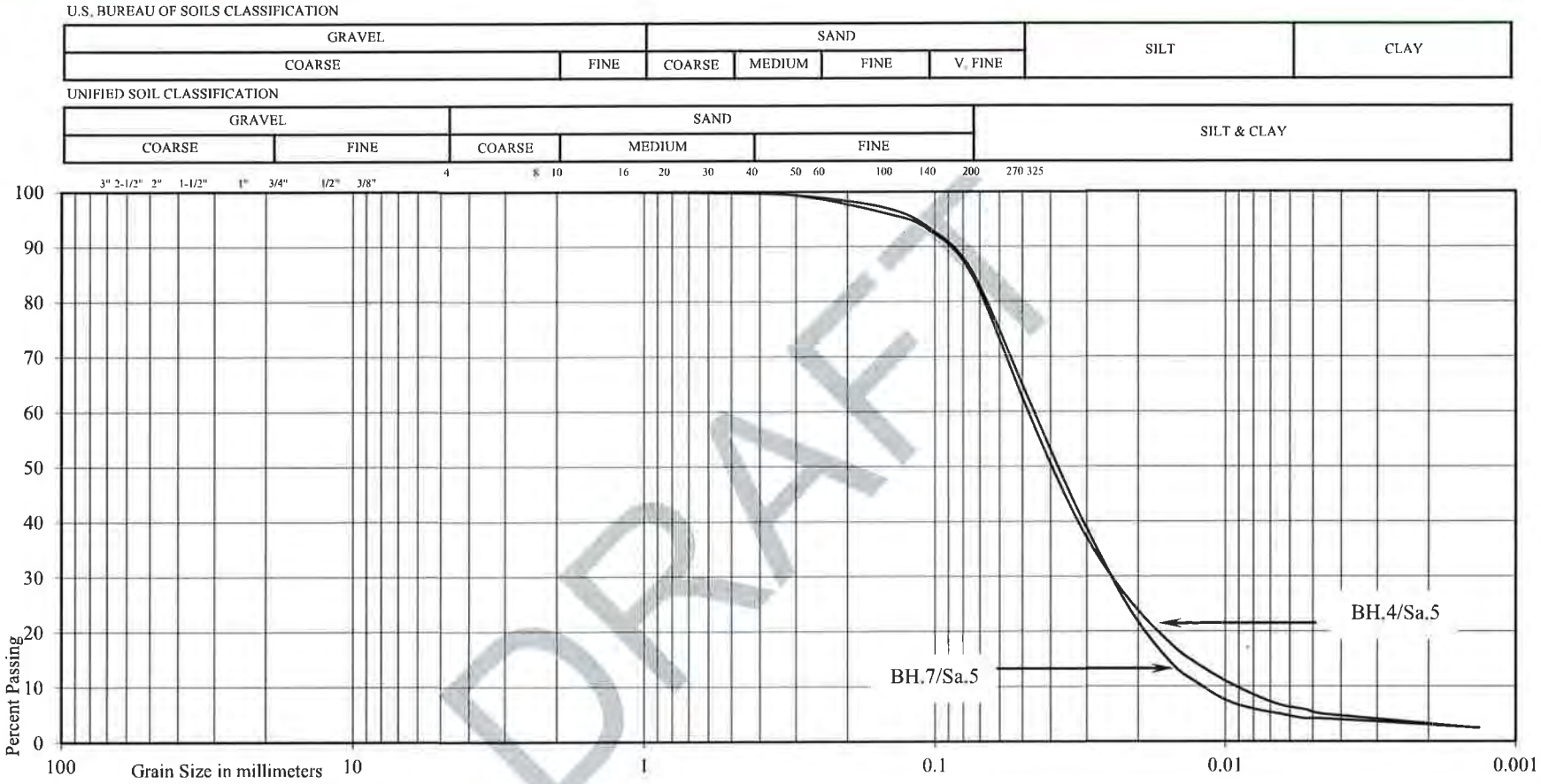
Classification of Sample [& Group Symbol]: SILTY CLAY
a tr. of sand and some fine sand

Figure: 13

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1611-S079



Project:	Proposed Land Acquisition	
Location:	Trulls Road and Pebblestone Road, Municipality of Clarington	
Borehole No:	4	7
Sample No:	5	5
Depth (m):	3.3	3.3
Elevation (m):	142.3	141.7

BH./Sa.	4/5	7/5
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	16	17
Estimated Permeability (cm./sec.) =	10^{-4}	10^{-4}

Classification of Sample [& Group Symbol]: SILT

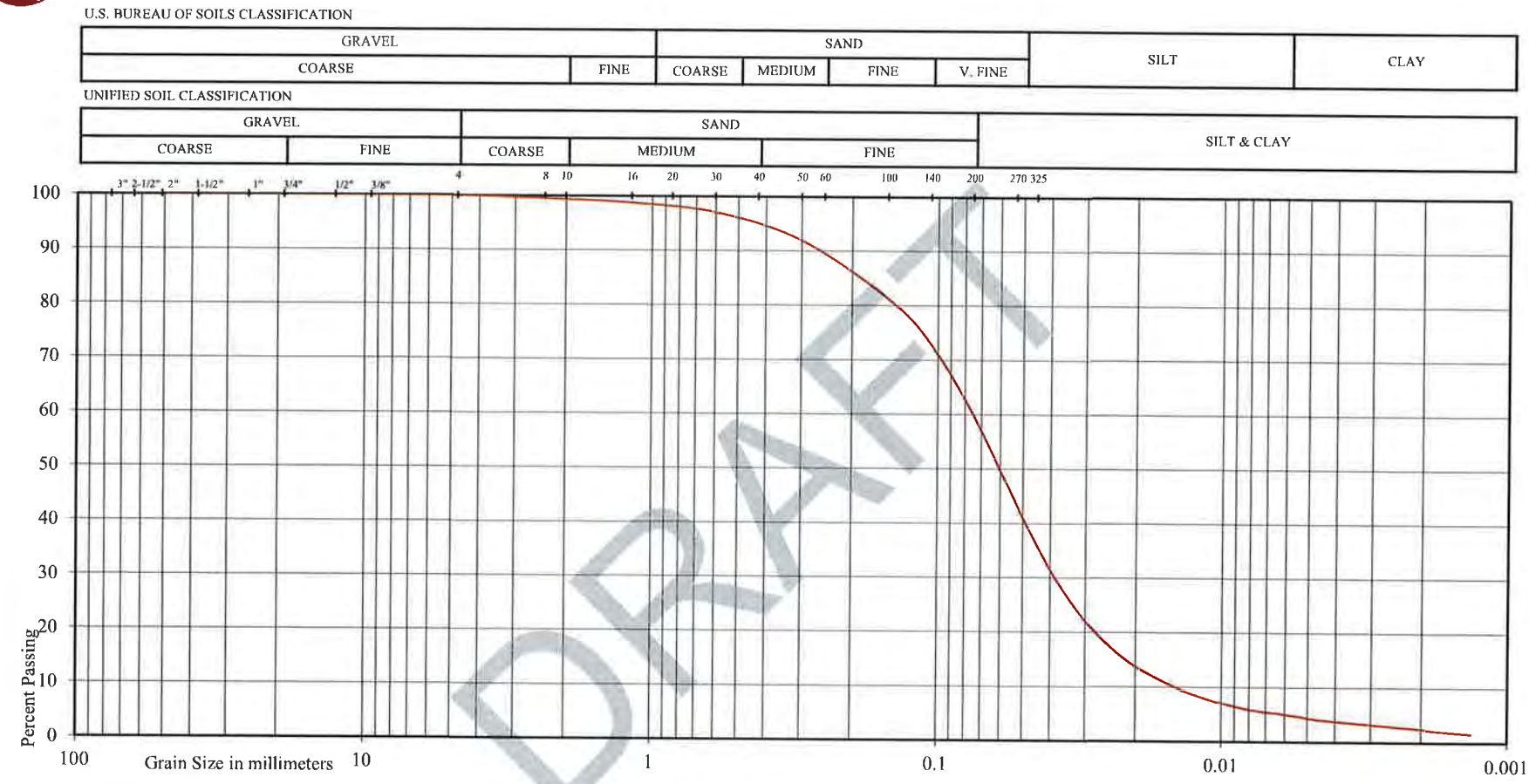
some sand and some fine sand, a tr. of clay

Figure: 14

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1611-S079



Project: Proposed Land Acquisition

Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Borehole No: 2

Sample No: 6

Depth (m): 4.7

Elevation (m): 142.4

Liquid Limit (%) = -

Plastic Limit (%) = -

Plasticity Index (%) = -

Moisture Content (%) = 18

Estimated Permeability (cm./sec.) = 10^{-4}

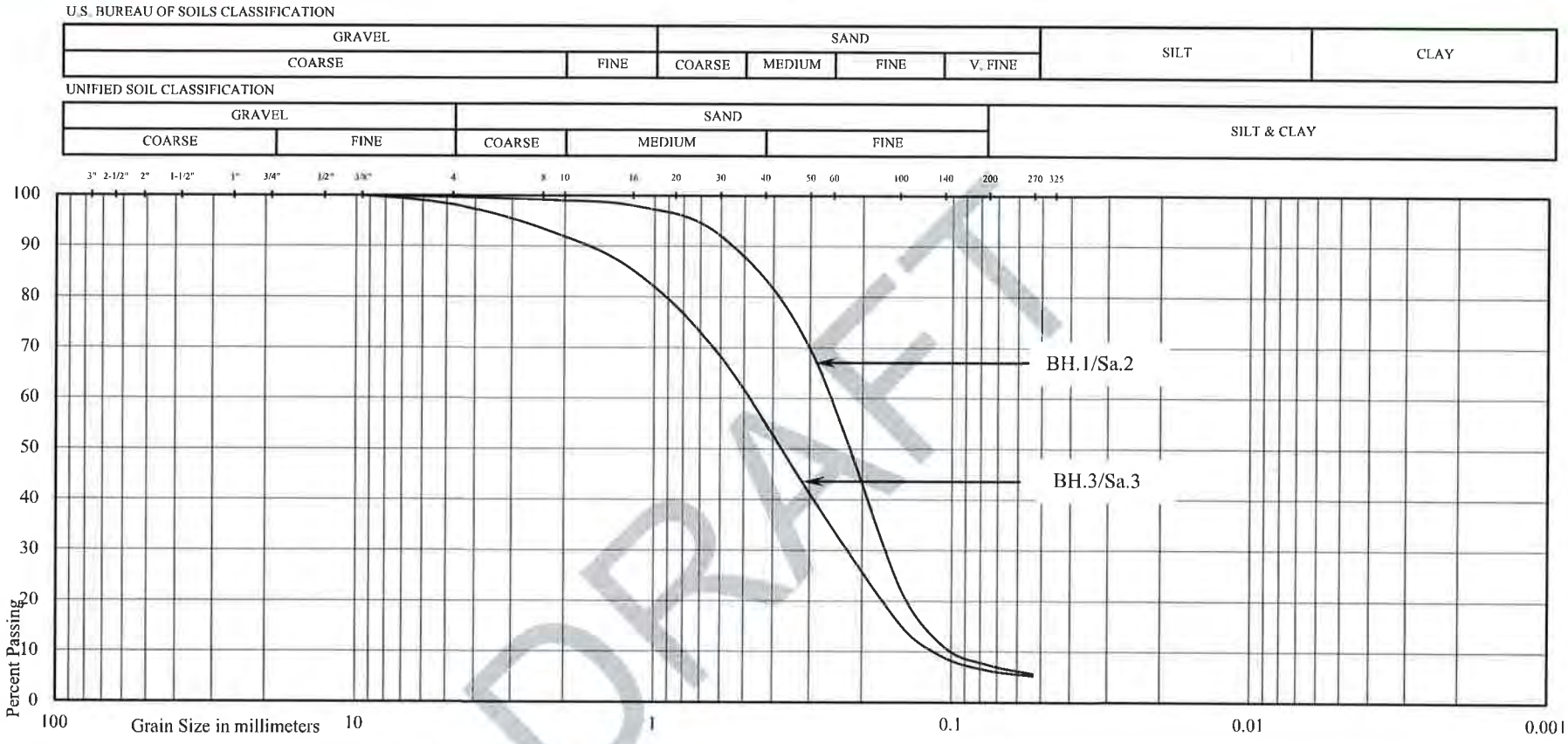
Classification of Sample [& Group Symbol]: SANDY SILT
a tr. of clay

Figure: 15

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1611-S079



Project: Proposed Land Acquisition

Location: Trulls Road and Pebblestone Road, Municipality of Clarington

Borehole No:	1	3
Sample No:	2	3
Depth (m):	1.1	1.7
Elevation (m):	145.7	145.8

BH./Sa.	1/2	3/3
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	19	15
Estimated Permeability (cm./sec.) =	10^{-2}	10^{-2}

Classification of Sample [& Group Symbol]: FINE TO MEDIUM SAND
trs. of silt, coarse sand and gravel

Figure: 16

R.J. Burnside & Associates Limited