



HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY

5426, 5452 AND 5584
LAKESHORE ROAD,
BALLANTRAE, ONTARIO

FAR SIGHT HOMES

PROJECT NO.: 161-06960-00
DATE: AUGUST 14, 2018

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August 14, 2018

Alcorn & Associates Limited
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Attention: Mr. Randy Alcorn

Dear Sir:

**Subject: Hydrogeological Assessment and Water Balance Study
5426, 5452 and 5584 Lakeshore Road, Ballantrae, Ontario**

WSP Canada Inc. is pleased to submit the attached report to document the Hydrogeological Assessment and Water Balance Study prepared for a proposed subdivision development at 5426, 5452 and 5584 Lakeshore Road, Ballantrae, Ontario.

The report provides an assessment of the existing hydrogeological conditions beneath the Site as well as water budgets for existing and future conditions to illustrate the likely changes in water balance that would be expected due to the proposed development. The post-development water budget considers the influence of the stormwater management system that has been proposed to mitigate potential impacts of introducing impervious surfaces.

KThank you for the opportunity to carry out this study on your behalf. We trust that this information is sufficient for your current needs. If you have any questions or require further information, please contact us.

Yours truly,

Lloyd Lemon, P.Geo., M.Sc.
Senior Project Geoscientist

JSW/nah

WSP ref.: 161-06960-00

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EXECUTIVE SUMMARY

WSP Canada Inc. (WSP) was retained by Far Sight Homes to prepare a Hydrogeological Assessment and Water Balance Study for the proposed residential development located at 5426, 5452 and 5584 Lakeshore Road, Ballantrae, Ontario (Site).

The proposed development area lies within the Oak Ridges Moraine physiographic region as defined by Chapman and Putnam (1984). The Oak Ridges Moraine is typically characterized by sand or gravel hills with level tracts of sand between them. The area in and surrounding the Site consists of Kame moraines.

The Site currently contains a wetland along the southern property boundary adjacent to the manmade pond. The wetland is fed by run-off from the Site and discharges off-site to through the southern property boundary via a culvert underneath Lakeshore Road.

Based on the stratigraphy observed during the borehole drilling and test pit excavations at the Site and well records from Ministry of Environment and Climate Change Water Well Information System, the Site is predominantly underlain by alternating layers of sand and silt with isolated layers of fill, silty sand/sandy silt and clayey silt observed in certain boreholes.

Based on water elevations from April 2017 that were collected as part of the bi-monthly monitoring program, the local groundwater flow direction is to the southeast across the Site. Groundwater levels at the Site fluctuated from a seasonal high of 0.2 m bgs (April 2017) to a seasonal low of 4.57 m bgs (October 2016). The seasonal high was observed at OW16-1 which is located in the area of the realigned drainage channel.

In-situ hydraulic conductivity testing was conducted at all six (6) monitoring wells on June 30, 2016. The results of these test indicate that the hydraulic conductivity of the soil at the Site range from 1.17×10^{-4} m/sec to 1.47×10^{-5} m/sec. These results are consistent with the observed soil descriptions of medium to fine sand in which the monitoring wells are screened.

Representative samples of groundwater were collected from the six (6) monitoring wells on June 30, 2016. The results of the tests indicated that parameter concentrations are less than Ministry of the Environment and Climate Change (MOECC) Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for All Types of Property Use (Coarse Textured Soil).

The Climate-Based Water Budget indicates that average annual precipitation over the past 30 years is 857.7 mm/year. The available moisture surplus at the Site ranges between 283.8 mm/yr to 292.8mm/year depending on the type of soil and vegetation cover. The moisture surplus will reflect the infiltration and runoff based on the soil properties, slopes, and vegetation within individual catchments.

Under existing conditions, there are two (2) on-site catchments and three (1) off-site catchment. Runoff generated on-site outlets at two (2) different locations.

- (a) Runoff from the majority of the Site is directed to the drainage ditch which connects to the existing wetland and discharges over the southern property boundary via a culvert underneath Lakeshore Road.
- (b) Runoff from a small portion of the site located in the southwest corner flows off-site to the south via overland flow.

The Pre-Development Water Budget reflects infiltration for the Site of approximately 61,016 m³/yr and runoff from the Site of approximately 20,663 m³/yr.

The Post-Development Water Budget reflects changes in land use to include increased areas of impervious surfaces (i.e. roads, buildings etc.) and re-grading. Under the proposed development conditions there are ten (10) on-site catchments and three (3) off-site catchment. A significant portion of the runoff is directed to three (3) different StormTech infiltration chambers while the remainder is conveyed to the drainage channels by the proposed storm sewers and/or overland flow. Runoff directed to the drainage channels flows to the existing wetland and is discharge off-site via the culvert underneath Lakeshore road.

The Post-Development Water Budget predicts a total on-site infiltration of 91,350 m³/yr. Of the total infiltration, 47,067 m³/yr infiltrates through pervious areas and 44,283 m³/yr infiltrates as a result of runoff from developed areas being directed to the on-site infiltration chambers. Overall, this is a increase of 50% relative to the Pre-Development case, and represents an infiltration surplus of 30,334 m³/yr. At this time, additional mitigation measures are not required as there is an infiltration surplus.

The Post-Development Water Budget predicts a net runoff of 21,338 m³/yr over the Site area. This is an increase of 3% or 675 m³/yr relative to the Pre-Development case. The estimated runoff exiting the Site via the wetland and culvert is predicted to increase by 6% and the runoff directed off-site to the southwest will decrease by 100%.

The Site lies within an area designated as WHPA-Q. Policies in the Lakes Simcoe and Couchiching Source Protection Plan for WHPA-Q require that recharge be maintained or enhanced. The water balance calculations demonstrate that the development, as proposed with the stormwater management design as prepared by Sabourin Kimball & Associates Ltd. (2018), will enhance the pre-development infiltration and hence, complies with these policies.

The majority of the Site is not within a mapped SGRA. A small portion of the southeast corner of the site that has already been developed is shown to have high sensitivity. The proposed development design provides for a very minor increase in net off-site run-off and enhancement of on-site recharge. This is not anticipated to negatively impact the features protected by the SGRA or ESGRA policy areas.

The majority of the central and east part of the Site is mapped as a Highly Vulnerable Aquifer under the Assessment Report for the Lakes Simcoe and Couchiching Source Protection Area as well as the Oak Ridges Moraine Conservation Plan. The proposed land use as residential is expected to have minimal potential to affect underlying groundwater resources.

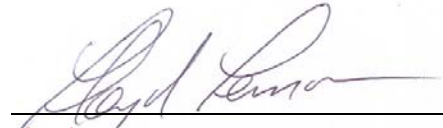
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1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Alcorn & Associates Limited to prepare a Hydrogeological Assessment and Water Balance Study for the proposed subdivision development located at 5426, 5452 and 5584 Lakeshore Road, Ballantrae, Ontario, herein referred to as the Site. The location of the Site is shown on **Figure 1**.

The Site is located approximately 430 m east of Highway 48 and approximately 200 meters south of Aurora Road in Ballantrae, Ontario. The Site is approximately 26.9 hectares (66.5 acres) in size, rectangular in shape, and is currently occupied by agricultural fields, wooded areas, uncultivated land, three (3) residential dwellings and a pond in the southeast corner. The existing conditions at the Site are shown in **Figure 2** and the development plans provided by WSP are included in **Appendix A**.

The proposed development conditions are shown in **Figure 3** and have been included in **Appendix A**. Under post-development conditions, the Site will include 141 residential lots draining to a series of StormTech infiltration chambers and the on-site creek which flows through the center of the Site.

This report documents the work performed to provide an understanding of the hydrogeological conditions at the Site, to prepare a water balance, and to provide preliminary recommendations for Site design and construction.

1.1 OBJECTIVES AND SCOPE

The need for a Hydrogeological Assessment and Water Balance Study was identified to help support the development application process and to quantify changes in Site runoff, infiltration and evapotranspiration between the pre- and post-development conditions for the development plan.

The Hydrogeological Assessment and Water Balance Study has been designed to:

- Review historical information and integrate findings.
- Identify the inventory of groundwater users within 500 m of the property.
- Confirm groundwater flow directions and patterns.
- Confirm and identify potential watershed divides, if any, which control groundwater flow.
- Characterize the water quality of the shallow groundwater.
- Characterize the relationships between on-site groundwater flow systems and adjacent surface water bodies.
- Create an annual water budget for the existing conditions at the property for use as a baseline.
- Determine a future annual water budget for the proposed development scenario.
- Identify significant changes to the water balance or to the form and function of the groundwater or surface water systems that might result from future plans and provide recommendations for mitigative measures to address these changes.
- Prepare a project report.

1.2 ANALYSIS AND DOCUMENTATION

The following published information and mapping was reviewed and considered in our analysis of the Site:

- Hydrogeological Assessment – 5452 Lakeshore Road, WSP, January 2016
- Hydrogeological Assessments - Conservation Authority Guidelines to Support Development Applications, April 2013.
- Assessment Report, South Georgian Bay Lake Simcoe Source Protection Region, Part 1 (Lake Simcoe, May 2015 update). Approved Lakes Simcoe and Couchiching Source Protection Plan.
- Ministry of Environment and Climate Change Water Well Information System (MOECC WWIS);

— Other sources of information as listed in Section 8.0.

2 REGIONAL SETTING

2.1 PHYSIOGRAPHY

The regional physiography for the Site area is shown in **Figure 4**. The proposed development area lies within the Oak Ridges Moraine physiographic region as defined by Chapman and Putnam (1984). The Oak Ridges Moraine consists of sand or gravel hills with level tracts of sand between them. The landforms in the area within and surrounding the Site consist of kame moraines.

2.2 DRAINAGE

Regional topography is illustrated on **Figure 5**. The topography of the Site is generally sloping toward the center and south of the property. The topography at the Site has elevation that ranges from 331 metres above sea level (m asl) to 334 m asl. The topography is generally higher to the north and along the west and east edges and lower in the center and to the south edge of the Site.

The Site is located approximately 2.1 km north of the divide between the Lake Simcoe Watershed and the Lake Ontario Watershed.

The Site currently contains a wetland along the southern property boundary adjacent to the manmade pond. The wetland is fed by run-off from the Site and discharges off-site to through the southern property boundary via a culvert underneath Lakeshore Road. The area of the pond is not within the current boundary of the proposed development.

2.3 REGIONAL GEOLOGY

The near surface soils are the top unit in a layered sequence of glacial and interglacial sediments that comprise the stratigraphic profile overlying bedrock beneath the Lake Simcoe region. The distribution of surficial soil types in and around the Site are shown on **Figure 6**. The surficial soils at the Site are predominantly characterized by sand deposits. The deposits and stratigraphy for the regional area are described in a series of papers and posters prepared by the Geological Survey of Canada under the direction of Dr. David Sharpe.

The stratigraphic profile beneath Oak Ridges Moraine area typically includes the following layers, from youngest to oldest:

- 1) Recent deposits.
- 2) Oak Ridges Moraine (ORM) Sediments
- 3) Newmarket Till.
- 4) Thorncliffe Formation.
- 5) Sunnybrook Drift.
- 6) Scarborough Formation.
- 7) Don Formation.
- 8) York Till.
- 9) Bedrock.

The Site area is located within the ORM and some of these deposits may not all be observed at this location.

The ORM sediments are a complex package of granular sediments deposited in the meltwater at the later stages of the last glacial period, which serve as the topographic and groundwater divide between Lake Simcoe and Lake Ontario. These deposits generally become finer, and typically become thinner and eventually pinch out away from the original outlets of meltwater. Certain areas with the ORM sediments may be overlain by a thin layer of Halton Till.

The Newmarket Till represents a regionally extensive stratum that is associated with the most recent period of glaciation. This till is typically dense to very hard and sandy to silty in texture with relatively low gravel content.

The stratigraphic layers between the Newmarket Till and the underlying bedrock are commonly grouped as the Lower Sediments. The Lower Sediments are considered to have been formed by similar cycles of earlier glacial advances and retreats and associated meltwater events that resulted in the deposition of the Newmarket Till and Oak Ridges Moraine sediments. Five (5) stratigraphic layers that constitute the Lower Sediments are described below, although not all are interpreted to occur below the study area.

- The Thorncliffe Formation is a complex of stratified glaciofluvial and glaciolacustrine deposits. The texture of the Thorncliffe Formation is highly variable and is best described as fine-grained, with interbedded coarse-grained material capable of yielding notable amounts of water.
- The Sunnybrook Drift is a fine-grained material deposited in glacial and proglacial lacustrine depositional environments (diamicton). The advance of the ice sheet blocked the main drainage from the regional basin, which caused water levels to rise and form a deep lacustrine environment with deposits including varved clays.
- The Scarborough Formation is a coarsening upward sequence of sediment that ranges from clay/silt rhythmites (fine-grained) to channelized cross-bedded sands (coarse-grained). The coarser fractions of this delta are a potential source of groundwater.
- The Don Formation is only rarely preserved within southern Ontario and consists of alternating beds of fossiliferous sand and mud.
- The York Till was deposited immediately overlying the bedrock by the preceding Illinoian glaciation. This till occurs only sporadically within the study area and is believed to be preserved in lows upon the bedrock surface. The till is dark grey with a sandy silt matrix and includes clusters of the underlying shale.

The bedrock in the study area is mapped as shale/limestone/dolostone/siltstone of the Blue Mountain Formation (Brennand et al., 1998) as illustrated on **Figure 7**. The depth to bedrock is estimated to be between 80 to 85 metres below ground surface, based on bedrock topography mapping and topographic mapping of the ground surface (Department of Energy, Mines and Resources, 1985). A map of overburden thickness is provided in **Figure 8**. The thickness of overburden is typically greatest along the crest of the Oak Ridges Moraine or in areas where there are topographic lows in the underlying bedrock surface.

2.4 REGIONAL HYDROGEOLOGY

The movement of groundwater through the subsurface is controlled by the hydraulic gradients and the relative distribution of coarse and fine-grained sediments. In general, water will move laterally through coarse-grained sediments (sands and gravels) and vertically through fine-grained sediments (silts and clays). As such, the geologic units are typically grouped into hydrostratigraphic units that reflect the capacity of the geologic units to transmit water. Hydrostratigraphic units are considered to be either aquifers (with good capacity to transmit water) or aquitards (which typically impede transmission of water). Ultimately the distribution and interconnection of aquifers and aquitards are responsible for observed groundwater movement.

Earthfx Inc. (2006) grouped the regional stratigraphic profile into a seven-layer hydrostratigraphic profile as follows:

- 1) Recent Deposits
- 2) Oak Ridges Aquifer Complex (ORAC).
- 3) Newmarket Aquitard.

- 4) Thorncliffe Aquifer Complex.
- 5) Sunnybrook Aquitard.
- 6) Scarborough Aquifer Complex.
- 7) Bedrock.

The Oak Ridges Aquifer Complex is a regional aquifer system in Ontario that corresponds to the area where the Oak Ridges Sediments are deposited. The aquifer is a significant source of groundwater for domestic, commercial, industrial, institutional, agricultural, and municipal water supplies. The ORAC provides baseflow to the headwaters of creeks and rivers where the Halton Aquitard is absent. The shallow water table will typically be observed within this layer. The ORAC is present at the Site.

The Newmarket Aquitard consists of the Newmarket Till and low permeability deposits that are known to infill the erosional channels. The Newmarket Aquitard is considered to be a leaky confining layer that provides protection from contamination to aquifers within the underlying hydrostratigraphic units. The Newmarket Aquitard may be present at ground surface beneath the southern part of the Site.

The Thorncliffe Aquifer Complex consists of fine to coarse-grained sediments of the Thorncliffe Formation. Local sand and gravel deposits within the Thorncliffe Aquifer Complex provide high yield wells. Groundwater in this layer is typically under pressure and in areas to the south of Aurora, the groundwater is under artesian pressure which can result in flowing wells.

The Sunnybrook Aquitard separates the Thorncliffe and Scarborough Aquifer Complexes. This aquitard demonstrates low permeability, provides some resistance to vertical groundwater movement, and protects the underlying aquifer from potential contaminant movement.

The Scarborough Aquifer Complex consists of fine to coarse-grained sediments associated with the Scarborough Formation. In general, these sediments tend to be coarse-grained and thicker where they fill topographic lows and valleys in the underlying bedrock surface. Groundwater within the Scarborough Aquifer Complex is typically under pressure, but only local artesian conditions occur. Locally, the Scarborough Aquifer Complex produces high well yields suitable for municipal or commercial wells. Due to its depth and presence of shallower aquifers, the Scarborough Aquifer Complex is not exploited extensively for private water supplies.

2.4.1 REGIONAL GROUNDWATER MOVEMENT

In general terms, precipitation infiltrates vertically into the surficial sand/gravel soil units. Groundwater will primarily move downward to the water table within the upper aquifer or aquitard unit. Groundwater will then tend to flow up or down through the aquitard units and laterally within the aquifers. Groundwater flow patterns can be influenced by established watercourses where there is potential for groundwater discharge to supply baseflow into the watercourses. The rate of groundwater discharge is controlled by the relative permeability of the recent deposits at the base of the streams. Discharge as baseflow is typically low through fine-grained base soils and higher where the streams have eroded down into coarser aquifers.

The horizontal groundwater movement through the subsurface aquifers tends to reflect the ground surface topography and the presence of stream channels.

3 WORK PERFORMED

The work program for the Hydrogeological Assessment and Water Balance Study included the following activities:

- 1) Description of the natural Site conditions: surface features, surface topography, soil types and stratigraphy.
- 2) Identification of current users of groundwater within 500 m of the subject property through the review of the Ministry of Environment and Climate Change (MOECC) Water Well Information System.
- 3) Installation of six (6) groundwater monitoring wells at various locations throughout the Site.
- 4) Monitoring of groundwater quality and elevations in the monitoring well network.

- 5) Single-well response tests on the six (6) monitoring wells to determine the relative horizontal hydraulic conductivity of saturated soils adjacent to the well screen.
- 6) Preparation of an annual climatic water budget and Site-specific water balance for Pre and Post-Development conditions.

3.1 BACKGROUND REVIEW OF GEOLOGICAL CONDITIONS

The geologic conditions beneath the proposed development were reviewed using published map sources, records from work on adjacent properties, and the WWIS database as maintained by the MOECC.

Water well records within a 500-metre radius of the Site were reviewed to obtain information on existing wells and to provide information on the geology of the area. A summary of the well record search is provided in Table B-1, **Appendix B** and water well record locations are plotted on **Figure 9**.

In addition, stratigraphy information from WSP's previous Hydrogeological Assessment (WSP, 2016) for 5452 Lakeshore Road was incorporated as part of the background review. Six (6) monitoring wells (MW15-1 to MW15-6) and six (6) test pits (TP14-01 to TP14-06) were completed as part of the previous Hydrogeological Assessment for 5452 Lakeshore Road. The locations of these boreholes and test pits are shown on **Figure 2**.

3.2 BOREHOLE DRILLING AND TEST PIT EXCAVATION

Ontario One Call was consulted to identify where existing public utilities entered the Site boundaries prior to initiating on-site activities. In addition, given that the Site is a private property, WSP retained the services of a private utility locator to clear the specific borehole and test pit locations from potential interference with private utilities.

The borehole drilling and monitoring well installation was carried out between May 30 and June 3, 2016 while the test pits were excavated on June 27, 2016, after the receipt of utility clearances. Drilling and excavation services were provided by Strata Soil Sampling of Mount Albert, Ontario and Burns Brothers Excavating of Stouffville, Ontario, respectively. A Geoprobe® model 782DT direct push rig was used for borehole drilling and monitoring well installation. A WSP technician was on-site to supervise the drilling, monitor installation and test pit activities.

The borehole and test pit locations are shown on **Figure 2**. The drilling program consisted of installing six (6) monitoring wells, designated as OW16-1 to OW16-6, to depths ranging from 5.2 m and 6.1 m below ground surface (bgs). An additional five (5) boreholes, designated as BH16-1 to BH16-5, were advanced to a depth of 8.1m bgs in support of the Geotechnical Investigation. Four (4) test pits, designated TP16-1 to TP16-4 were also excavated to depths ranging from 3.00 m to 3.20 m bgs. Records of the observed stratigraphy in the boreholes and test pits are provided in **Appendix C**.

3.3 MONITORING WELL INSTALLATION

The positions of the monitoring well screens in OW16-1 to OW16-6 were determined based on the observed soil profile and were targeted to correspond with identified sandy or wet and more permeable layers of the soil within the upper 7 m of ground surface. This depth was determined based on observations from past investigations in the area.

The monitoring wells were constructed upon reaching the target depth in the direct push boreholes. The wells were constructed in individual boreholes using 52 mm (2 inch) inside nominal diameter (ID), schedule 40, environmental grade PVC riser pipes and well screens. The well screens are factory slotted with No. 10 slot size, and are 3.05 m (10 feet) long. The wells were constructed to leave the PVC riser pipe between 0.84 and 0.88 m above ground surface.

The borehole annulus around the well screens were filled with No. 2 silica sand to approximately 0.6 m above the top of the well screen to provide a filter pack. A low-permeability seal was placed above the filter pack using bentonite pellets. A 1.5 m long, lockable, steel, protective casing was placed over the PVC riser pipe.

The monitoring well installations were completed to O. Reg. 903 standards and a well tag was submitted to the MOE by the licensed driller for each individual well. The monitoring well construction details are summarized in on borehole records provided in **Appendix C**.

3.4 GROUNDWATER LEVEL MEASUREMENTS

Observations during the drilling OW16-1 to OW16-6 confirmed that the water table is relatively shallow beneath the Site. The well screen intervals were placed at depth in stratigraphic positions that were considered to have potential to yield water.

The depth to groundwater was measured in monitoring wells and were observed in the test pit excavations. Static groundwater elevations were estimated by subtracting the measured water depth from the determined reference elevation at each monitoring well. The groundwater elevations in OW16-1 to OW6-6 were measured immediately after construction and in May and June 2016.

A bi-monthly monitoring program was implemented in June 2016 to record groundwater levels at the Site every two (2) months for a period of one year. The purpose of the bi-monthly monitoring program was to characterize seasonal variations in groundwater level and to determine the seasonal high groundwater level. In addition to recording water levels at wells installed as part of this investigation, water levels at the pre-existing wells from the original Hydrogeological Assessment for 5452 Lakeshore Road (WSP, 2016) were recorded. A summary of groundwater elevations is provided in Table D-1 of **Appendix D**.

3.5 WELL DEVELOPMENT

The monitoring wells were developed after installation to remove silt and sediment. The purpose of development is to ensure that representative formation water is obtained for water quality analysis.

The volume of water in the well casing was estimated based on the static groundwater level measurement. A dedicated Waterra™ Inertial pump was installed in the monitoring well and used to remove water from the well. Standing water was observed in all six (6) monitoring wells.

3.6 SINGLE-WELL HYDRAULIC RESPONSE TEST

Single well hydraulic response tests were performed to estimate the saturated hydraulic conductivity of the soil materials adjacent to the well screens in the six (6) monitoring wells on June 30, 2016. For this program, the single well hydraulic response test consisted of monitoring the recovery of the water level to the static position after pumping the monitoring well for a specified period of time. One (1) test was performed on each well. Prior to the start of the tests, the static water level was measured in each monitoring well. For all single-well hydraulic response tests, the water level within the monitoring wells returned to the static level within a few minutes.

The hydraulic conductivity was estimated from the data using the methods of Hvorslev (1951). The computer program AquiferTest™ was used to assist in estimating hydraulic conductivity results. Analysis results are included in **Appendix E**.

3.7 WATER QUALITY

Representative samples of groundwater were collected from the six (6) monitoring wells on June 30, 2016. A duplicate sample was taken for QA/QC purposes. Samples were collected via the dedicated Waterra™ inertial pump placed in the monitoring well. Field measurements of temperature, electrical conductivity, and pH were recorded at the time of sample collection. The water samples were collected in sample bottles prepared by and provided by ALS Environmental Laboratories (ALS) located in Waterloo, Ontario.

The water quality samples were submitted to determine concentrations of:

- General water quality parameters (major cations, major anions, pH)
- Dissolved Metals
- Dissolved Organic Carbon
- Nutrients.

The Certificates of Analysis provided by ALS are provided in **Appendix F**.

The water quality results were reviewed with respect to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for All Types of Property Use (Coarse Textured Soil), hereinto referred to as the “MOECC Table 2 SCS”, as outlined in the Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act (April 15, 2011). This table was selected as it provides a conservative assessment of potential water quality concerns in groundwater as the area surrounding the Site is serviced by municipal water supplies.

3.8 WATER BUDGET ANALYSIS

A Water Budget provides an accounting of the water inputs and water outputs within a defined area. In this case, the area of the proposed development is used to estimate the water budgets in the existing condition (Pre-Development) and in the future condition (Post-Development).

The basic assumption of a water budget analysis is that there is a balance between water inputs and outputs, unless there is a clear understanding that water is being removed from storage within the system. The water budget is typically represented in a simple form as:

$$\text{Water In} = \text{Water Out}$$
$$P + EI = ET + IR + RO + EO$$

Where:

- P = Precipitation
- EI = External Inputs (including run-on, irrigation, and vertical/lateral transfers)
- ET = Evapotranspiration
- IR = Infiltration Recharge
- RO = Runoff
- EO = External Outputs (including water taking, and vertical/lateral transfers)

In more complex scenarios, lateral inputs through groundwater and surface water, movement between subsurface aquifer layers, and removal from storage can also be considered.

The objectives of the Water Budget Analysis are to:

- a) quantify the water budget equation for the existing conditions;
- b) quantify the water budget equation for proposed future conditions; and
- c) illustrate that there is either no significant change (i.e. a water balance) between the existing or future conditions, or that mitigation methods can be employed to minimize the estimated change.

The Water Budget Analysis was completed in four main steps:

- Step 1) Analysis of Climatic Data;
- Step 2) Pre-Development Water Budget;
- Step 3) Post-Development Water Budget; and
- Step 4) Post-Development Water Budget (including mitigation).

A previous iteration of the Water Balance Study identified potential infiltration deficits that were subsequently addressed by the current stormwater management plan. In this case, Steps 3 and 4 were combined. The water budget analysis has been completed using methods outlined in “Hydrogeological Technical Information Requirements for Land Development Applications” (MOECC, 1995).

3.8.1 ANALYSIS OF CLIMATE DATA

Climate data available from on-line resources maintained by the Meteorological Service of Canada (Environmental Canada) were obtained and analyzed to determine the appropriate values for annual average precipitation and evapotranspiration. The surplus left over after subtraction of the evapotranspiration from the average precipitation is considered to represent the quantity of water available for infiltration and runoff under existing conditions.

Climate data was obtained for the King Smoke Tree Climate Station for the period from 1981 until 2010. These data are provided in Table G-1, **Appendix G**. Mean monthly temperatures were calculated by averaging mean monthly minimum and maximum temperatures. Temperature data were derived from the 30 year (1981-2010) climate data summaries.

The Thornthwaite-Mather method was used to estimate potential and actual evapotranspiration on a monthly basis. The Thornthwaite-Mather method is based on an empirical relationship between potential evapotranspiration and mean air temperature. The method also takes into account the water holding capacity for the soil to compute the actual evapotranspiration and the resulting moisture surplus that is available for infiltration and runoff.

The water holding capacity of the soil depends on two different factors – the soil type and structure, and the type of vegetation growing on the surface. Different types of soil hold different amounts of moisture storage capacity, while different species of vegetation will send roots into the soil to different depths and therefore retain varying amounts of moisture. The water holding capacity for each soil type/vegetation type combination found on the Site was determined from the Environmental Design Criteria of the Storm Water Management Planning and Design Manual published by the Ontario Ministry of the Environment and Climate Change (“MOECC”) in 2003.

The monthly estimates were used to calculate an annual average for precipitation, potential evapotranspiration, actual evapotranspiration, and available moisture surplus for each combination of soil and vegetation type found on-site. The moisture surplus represents the quantity of water available for infiltration and runoff on an annual average basis. Tables that document the details of the Thornthwaite-Mather analysis for the combinations of soil type and land use are provided in **Appendix G**.

3.8.2 PRE-DEVELOPMENT WATER BUDGET

The Pre-Development Water Budget was estimated using the approach recommended in Table 2 of the “Hydrogeological Technical Information Requirements for Land Development Applications” (MOECC, 1995). The steps taken to estimate the Pre-Development Water Budget included:

- 1) Identify sensitive features and to observe existing topography, soil types, and other controls on infiltration and runoff.
- 2) Delineating drainage catchments and sub-catchments based on observed drainage outlets and physical characteristics as described below.
- 3) Estimating the quantities of infiltration and runoff for each of the sub-catchment areas and preparing summary estimates for catchments related to identified drainage outlets and for the proposed development area.

The drainage catchments and sub-catchments were defined by considering the following factors:

- Existing elevations;
- Existing property boundaries;
- Post-development features and property boundaries;

- Natural topographical features;
- Slope ratio; and
- Land cover, and
- Land use.

The sub-catchments defined for the Pre-Development Water Budget also considered the proposed development areas and future drainage considerations for the proposed development. This was incorporated into the analysis to be able to demonstrate changes in drainage to the identified outlets and infiltration beneath the development area. The defined sub-catchments for the Pre-Development Water Budget are shown on **Figure 11** and in Table H-1, **Appendix H**.

The Infiltration Factor for each Pre-Development sub-catchment was estimated by adding the sub-factors for topography, soil type, and land cover as recommended in the MOECC methodology. A geographic information system (GIS) was used to evaluate the topography, soil type and land use for each of the Pre-Development, Current Condition, and Post-Development scenarios and to generate a set of sub-catchments that can be used in analysis of each scenario. Section 6 provides a characterization of the Site in terms of the topography, soil type, and land use as input into the water budget analysis. The calculated infiltration factor for each catchment was reviewed and updated manually, as a confirmation that they reflect actual conditions. Assumptions applied to the Pre-Development water budget scenario are described in Section 6.2.

The volume of Pre-Development Infiltration was estimated as the product of [sub-catchment area] x [moisture surplus] x [Infiltration factor]. The Pre-Development Runoff was estimated by subtracting the volume of infiltration from the total volume of moisture surplus for each sub-catchment. A detailed table to document the calculations of the Pre-development Water Budget is provided in **Appendix H**.

3.8.3 POST-DEVELOPMENT WATER BUDGET

The Post-Development Water Budget was estimated using a similar approach as outlined for the Pre-Development case. The proposed development plan and future drainage plan were used to establish new drainage sub-catchments that relate to the outlets identified in the Pre-Development case. Within each drainage sub-catchment, the area of pervious soils and impervious development (roads, driveways, amenities, and roofs) were estimated based on the Site and grading plans as provided by Sabourin Kimble & Associates Ltd.

For the pervious areas, the quantity of infiltration was calculated using the [pervious area] x [precipitation surplus] x [Infiltration Factor]. The Infiltration Factors were reviewed to correspond to the Post-Development conditions. The runoff for the pervious areas was estimated by subtracting the volume of infiltration from the total volume of precipitation surplus for the pervious area in each sub-catchment.

The volume of runoff from the impervious surfaces was estimated using the area of impervious surfaces and the volume of precipitation. A factor of 10% was considered to represent some evaporation in the course of runoff. This value is consistent with assumptions made on adjacent lands.

The Site will be municipally serviced for water and sewage. The Post-Development Water Budget reflects this.

The Post-Development Water Budget was compared to the Pre-Development Water Budget to evaluate the effects of the proposed development. A previous iteration of the Water Balance Study identified potential infiltration deficits that were subsequently addressed by the current stormwater management plan. The Post-Development Water Budget takes into account mitigation measures used to address the infiltration deficit that would exist if no mitigation measures were incorporated. As such, the Post-Development Water Budget did not require subsequent re-estimation to account for mitigation measures.

Details of the Post-Development Water Budget calculations are provided in **Appendix I**.

4 OBSERVATIONS

The information obtained during previous site studies was reviewed and analyzed to characterize the soil profile and the groundwater system at the Site.

4.1 SOIL PROFILE

Based on the stratigraphy observed during the borehole drilling and test pit excavations, the Site is predominantly underlain by alternating layers of sand and silt with isolated layers of fill, silty sand/sandy silt and clayey silt observed in certain boreholes.

A layer of topsoil ranging from 130 – 360 mm in depth was observed in OW1, OW2, OW5, OW6 and BH16-1 to BH16-5. Topsoil was not observed in OW3 and OW5. The topsoil was underlain by different soil types depending on location and these included: sand, sandy silt, silty sand and clayey silt. Layers of silty sand fill were also identified in BH16-1 and BH16-3 immediately below the topsoil. The first layer of stratigraphy typically extended to a depth of 1.5 – 1.8 m bgs. Below this level, the stratigraphy predominantly consisted of alternating layers of sand and silt of combinations of both down to a maximum depth of 8.1 m bgs.

The stratigraphy observed within the test pits was generally consistent with stratigraphy observed within the boreholes. A layer of topsoil ranging from 150 mm to 300 mm was observed within all test pits. Silty sand and fine to medium sand were identified in TP16-1 and TP16-2. A layer of gravelly coarse sand was observed in TP16-2 between 0.70 m and 1.00 m bgs. A layer of sand underlay the topsoil in TP16-3 which was followed by silt. The stratigraphy at TP16-4 differed slightly from the rest of the test pits. The topsoil at this location was underlain by a layer of silty sand followed by layers of clayey silt and silt and clay. A layer of sand extending from 2.50 m bgs to borehole termination underlay the silt and clay in TP16-4.

The stratigraphy observed during the borehole and test pit investigations is generally consistent with the stratigraphy information reported in the water well records obtained through the MOECC borehole logs. Table B-1 in **Appendix B** provides a list of water well records. Borehole and test pit logs are provided in **Appendix C**.

4.2 GROUNDWATER ELEVATIONS

Upon completion of drilling, the water level within each monitoring well was observed and recorded. The water levels ranged from 0.7 m bgs to 3.0 m bgs on May 30 and 31, 2018. Groundwater levels at the Site were subsequently monitored on a bi-monthly basis (every two months) for a period of one year during 2016 and 2017. The results of the monitoring program indicate that groundwater levels at the Site fluctuate from a seasonal high of 0.2 m bgs (April 2017) to a seasonal low of 4.57 m bgs (October 2016). The seasonal high was observed at OW16-1 which is located in the area of the realigned drainage channel.

Figure 10 presents a map illustrating Groundwater Elevations. The inferred groundwater flow direction based on April 2017 groundwater elevations is to the east across the Site. This inferred flow pattern is somewhat inconsistent with the topography observed at the Site. The monitoring well locations were chosen near the corners of the property and this may reduce the influence of topography and surface water drainage patterns in the center of the Site.

The Site's location to the north of the regional groundwater divide indicates that the local groundwater flow feeds the regional groundwater system to the north.

4.3 WATER USE

The three (3) residential dwellings located on the Site obtain water from municipal services and have private individual sewage systems. The proposed development will be municipally serviced for water and sewage.

4.3.1 MOECC WATER WELL SEARCH

A list of MOECC water well records within 500 m of the Site is provided in **Appendix B**. **Figure 9** illustrates the locations of wells located within 500 m of the Site property as per the MOECC WWIS. The well record database includes one hundred and seventy-two (172) water well records within a 500-metre radius of the Site. Of the well records, one hundred and nineteen (119) are water supply wells for domestic, irrigation, livestock, commercial and public purposes, twenty-three (23) are test holes or monitoring wells, twenty-six (26) are abandoned for other purposes, and five (5) are for other purposes.

Of the one hundred and nineteen (119) water supply wells, fifty-four (54) draw water from sand lenses at a depth less than 20 m, fifty-four (54) draw water from sand lenses at depths ranging between 20 and 40 m, and seven (7) draw water from silt, clay and sand lenses greater than 40 m. It is our understanding that this area is now municipally serviced for water. As such, it is likely that many of the domestic water supply wells have been removed from active use.

It is possible that the MOECC WWIS database includes other wells that are incorrectly located and there may be some wells for which well records are not on file at the MOECC.

4.4 SINGLE-WELL HYDRAULIC RESPONSE TESTS

The hydraulic conductivity estimates obtained from the monitoring wells for the single well hydraulic response tests ranged from 1.17×10^{-4} m/sec to 1.47×10^{-5} m/sec for the six (6) on-site monitoring wells. The highest and lowest hydraulic conductivity values were observed at OW16-3 and OW16-2 which are located in the southeast corner and central portion of the Site, respectively. These results are consistent with the observed soil descriptions of medium to fine sand in which the monitoring wells are screened.

The results of the single-well hydraulic response test are summarized in **Appendix E**.

4.5 WATER QUALITY

The results of water quality testing at the six (6) on-site monitoring wells are summarized in **Table 2**. The water quality analysis reports as provided by ALS are presented in **Appendix F**.

The concentrations of the parameters tested are less than the MOECC Table 2 SCS values.

5 WATER BUDGET ANALYSIS

The Water Budget Analysis is presented in the following sections. Section 5.1 describes the analysis of historical climate data to estimate annual average precipitation and potential evapotranspiration. Section 5.2 describes the Pre-Development Water Budget. Section 5.3 Describes the Post-Development Water Budget. Section 5.4 revisits the Post-Development Water Budget to consider the potential benefits of identified mitigation opportunities.

5.1 CLIMATE-BASED WATER BUDGET

The climate-based water budget calculations are included in Tables G-1 to G-4 (**Appendix G**) and are summarized in **Table 3**. The average annual precipitation for the thirty year normal data between 1981 and 2010 is about 857.7 mm/m²/year (mm/year). The annual potential evapotranspiration is calculated in Table G-1 at 584.0 mm/year. This equates to a potential water surplus of 369.8 mm/year and a soil moisture deficit of 96.1 mm/year. Thus the net annual water surplus based on potential evapotranspiration is 273.7 mm/year.

The calculations were expanded to include the water holding capacity of the soil as presented in Tables G-2 to G-4. This will produce a total moisture surplus based on the calculated actual evapotranspiration. Four (4) combinations of soil type and vegetation type were identified on the Site property for the Pre-Development and Post-Development scenarios. The majority of the surficial soil at the site is considered to be silt loam. The land use classifications and the corresponding water holding capacities are:

- Silt Loam, Urban Lawn (125 mm/year);
- Silt Loam, Cultivated (200 mm/year);
- Silt Loam, Uncultivated (250 mm/year); and
- Silt Loam, Woodland (400 mm/year).

Consideration of these factors produces a range of net annual moisture surplus between 283.8 and 301.8 mm/year as summarized in **Table 3**. The soils with higher water holding capacity effectively increase the water removed as evapotranspiration.

The calculated moisture surplus occurs during the winter, spring and fall months, and a water deficit occurs during the summer months. Much of the water surplus in the winter accumulates as snow. Snowmelt during the spring results in the runoff or infiltration of precipitation that is effectively equivalent to the winter and spring water surplus.

5.2 PRE-DEVELOPMENT WATER BUDGET

The Pre-Development Water Budget was developed based on topographic information provided by Ontario Base Mapping and the Site Grading Plan provided by Sabourin Kimble & Associates Ltd.

5.2.1 PRE-DEVELOPMENT CATCHMENTS

Figure 11 illustrates the delineation of drainage catchments and sub-catchments for the Site. The Site is comprised of two (2) internal (on-site) and three (3) external (off-site) catchment areas. The catchment areas have been further subdivided. The drainage sub-catchments are based on similar slopes, soils, and vegetation/land use. The drainage sub-catchments also include consideration of post-development drainage boundaries so that changes to drainage areas can be evaluated for the post-development conditions. The outlets for drainage of the identified Pre-Development catchments are as follows:

On-Site Catchments:

- **Pre-Development On-Site Catchment A:** Drains to the existing drainage channel which flows south to the existing wetland. Runoff in the wetland drains off-site through the southern property boundary through a culvert underneath Lakeshore Road.
- **Pre-Development On-Site Catchment B:** Drains off-site to the south via overland flow.

Off-Site Catchment:

- **Pre-Development Off-Site Catchment C:** Drains to on-site sub-catchment A-774 and is directed to the existing drainage channel which flows south to the existing wetland. Runoff in the wetland drains off-site through the southern property boundary through a culvert underneath Lakeshore Road.
- **Pre-Development Off-Site Catchment D:** Drains to on-site sub-catchment A-113 and is directed to the existing drainage channel which flows south to the existing wetland. Runoff in the wetland drains off-site through the southern property boundary through a culvert underneath Lakeshore Road.
- **Pre-Development Off-Site Catchment E:** Drains to on-site sub-catchment A-800 and is directed to the existing drainage channel which flows south to the existing wetland. Runoff in the wetland drains off-site through the southern property boundary through a culvert underneath Lakeshore Road.

Table H-1 (**Appendix H**) provides a summary of the data attributes used to estimate the infiltration factor for each pre-development catchment and sub-catchment. The infiltration factor determined the proportion of the annual water surplus that would infiltrate or runoff within each sub-catchment.

5.2.2 PRE-DEVELOPMENT ANALYSIS

Properties associated with area, slope, soil type, and land cover were analyzed and assigned to each Pre-Development sub-catchment. The values assigned to each Pre-Development sub-catchment are provided in Table H-1. These values were used to estimate an Infiltration Factor. The Infiltration Factors were reviewed to confirm that they are appropriate and adjusted if necessary. Existing paved areas were assumed to be impervious and to generate runoff equivalent to the precipitation volume minus a 10% evaporative loss. Gravel areas were assumed to have a surplus equivalent to that of urban lawn areas.

Table H-1 includes the overall analysis of the total Study Area's infiltration and runoff. Table H-1 also documents the calculation of volumes associated with input and output parameters for the Pre-Development conditions. These volumes are also expressed in terms of the number of mm of water within each sub-catchment area.

A summary of the Pre-Development water budget calculations is provided in **Table 4**. These values will be used to assess the changes that proposed development will create relative to the pre-development conditions.

5.2.3 PRE-DEVELOPMENT INFILTRATION

The estimated total infiltration for the Site is 61,016 m³/yr or an equivalent of 226.7 mm/year (mm/m²/yr). The calculated infiltration represents approximately 26.4% of the annual precipitation (857.7 mm/yr) and 74.7% of the estimated annual water surplus (303.5 mm/yr).

5.2.4 PRE-DEVELOPMENT RUNOFF

The total runoff for the Site is 20,663 m³/yr or an equivalent of 76.8 mm/year. The calculated runoff represents approximately 9.0% of the annual precipitation (857.7 mm/yr) and 25.3% of the estimated annual water surplus (303.5 mm/yr).

5.3 WATER BUDGET– POST-DEVELOPMENT CONDITIONS

The Post-Development Water Budget was based on the proposed concept plan presented as **Figure 12**. The Post-Development scenario introduces 141 residential dwellings, new driveway and roadway areas, and three (3) StormTech infiltration chambers.

5.3.1 POST-DEVELOPMENT CATCHMENTS

Under post-development conditions, the Site is comprised of ten (10) on-site catchments and three (3) off-site catchments. Sub-catchment delineations in Pre-Development conditions were maintained for the Post-Development analysis.

Under Post-Development conditions, the drainage ditch that is present under pre-development conditions is maintained through the wooded area. In addition, a new meandering drainage channel that drains off-site to the southeast is introduced.

Runoff from within the developed areas of the Site drains to one of the three (3) StormTech infiltration chambers via the on-site storm sewer system or directly to the on-site channel via overland flow and the on-site storm sewer system. Overflow from the StormTech infiltration chambers is released through a series of headwalls throughout the

Site. Runoff discharged through the headwalls drains to the on-site channel which flows off-site in the southeast corner. The outlets for each Catchment are summarized below:

On-Site Catchments:

- **Post-Development On-Site Catchment 201-A:** Drains to a series of rear lot catch basins (RLCB) via overland flow which connect to the on-site sewer system in Catchment 201b. Runoff collected in the storm sewer is directed to a storage pipe underneath the roadway in Catchment 201-b for quantity control (i.e. no infiltration), and is subsequently released to an oil-grit separator (OGS) and sand filter plunge pool that connects to the existing ditch in Catchment 205 and on-site channel. The channel flows connects to the existing wetland adjacent to the southern property boundary which discharges off-site through the southern property boundary via a culvert underneath Lakeshore Road.
- **Post-Development On-Site Catchment 201-B:** Drains to series of catch basins and manholes located in the roadway of Catchment 201b. Runoff collected in the storm sewer is directed to a storage pipe underneath the roadway in Catchment 201-b for quantity control (i.e. no infiltration), and is subsequently released to an oil-grit separator (OGS) and sand filter plunge pool that connects to the existing ditch in Catchment 205 and on-site channel. The channel connects to the existing wetland adjacent to the southern property boundary which discharges off-site through the southern property boundary via a culvert underneath Lakeshore Road.
- **Post-Development On-Site Catchment 202:** Twenty-three (23) of the lots within the Catchment contribute 75% of their roof runoff to rear yard bio-swales (which eventually drain to the storm sewer) and 25% contribute directly to the storm sewer. Seven (7) of the lots within the catchment contribute 100% of their roof runoff to the storm sewer (i.e. directly connected) while the remaining four (4) drain to the storm sewer system via overland flow. All runoff collected within the storm sewer is directed a StormTech infiltration chamber (StormTech 4) located in sub-catchment 208-650 for infiltration. Any overflow is released through a headwall which drains to the on-site channel. The channel connects to the existing wetland adjacent to the southern property boundary which discharges off-site through the southern property boundary via a culvert underneath Lakeshore Road.
- **Post-Development On-Site Catchment 203:** Drains to the on-site storm sewers via direct connection and overland flow. Runoff collected in the storm sewer is directed to a StormTech infiltration chamber underneath sub-catchment 203-592 and 205-649 for infiltration. Any overflow is released through a headwall which drains to the on-site channel. The channel connects to the existing wetland adjacent to the southern property boundary which discharges off-site through the southern property boundary via a culvert underneath Lakeshore Road. .
- **Post-Development On-Site Catchment 204-A:** Drains to the on-site storm sewers via direct connection, rear yard bio-swale or overland flow. Runoff collected in the storm sewer is directed to a StormTech infiltration chamber underneath sub-catchment 208-623 for infiltration. Any overflow is released through a headwall which drains to the on-site channel. The channel connects to the existing wetland adjacent to the southern property boundary which discharges off-site through the southern property boundary via a culvert underneath Lakeshore Road.
- **Post-Development On-Site Catchment 204-B:** Drains to the on-site storm sewers via RLCBs or direct connection. Runoff collected in the storm sewer is directed to a StormTech infiltration chamber underneath sub-catchment 208-623 for infiltration. Any overflow is released through a headwall which drains to the on-site channel. The channel connects to the existing wetland adjacent to the southern property boundary which discharges off-site through the southern property boundary via a culvert underneath Lakeshore Road.
- **Post-Development On-Site Catchment 205:** Drains to the on-site channel which connects to the existing wetland adjacent to the southern property boundary and discharges off-site through the southern property boundary via a culvert underneath Lakeshore Road.
- **Post-Development On-Site Catchment 206:** Drains to a series of RLCBs which connect to the storm sewer in Catchment 203. Refer to Catchment 203 (above) for further drainage information.
- **Post-Development On-Site Catchment 207:** Drains to a series of RLCBs at the east side of Catchment 204b which connect to the storm sewer. Refer to Catchment 204b (above) for further drainage information.
- **Post-Development On-Site Catchment 208:** Drains to the on-site channel which connects to the existing wetland. Runoff discharges off-site through the southern property boundary via a culvert underneath Lakeshore Road.

Off-Site Catchment(s):

- **Post-Development Off-Site Catchment 209:** Drains to the on-site channel in Catchment 208 which connects to the existing wetland. Runoff discharges off-site through the southern property boundary via a culvert underneath Lakeshore Road.
- **Post-Development Off-Site Catchment 210:** Drains to the on-site drainage channel in Catchment 205 which connects to the existing wetland. Runoff discharges off-site through the southern property boundary via a culvert underneath Lakeshore Road.
- **Post-Development Off-Site Catchment 211:** Drains to the on-site channel in Catchment 208 which connects to the existing wetland. Runoff discharges off-site through the southern property boundary via a culvert underneath Lakeshore Road.

Runoff from the developed areas in on-site catchment areas will be affected by the creation of buildings and driveway areas.

5.3.2 POST-DEVELOPMENT ANALYSIS

Properties associated with area, slope, soil type, and land cover were analyzed and assigned to each Post-Development sub-catchment. The values assigned to each Post-Development sub-catchment are provided in Table I-1 (**Appendix I**). These values were used to estimate an Infiltration Factor. The Infiltration Factors were reviewed to confirm that they are appropriate and adjusted if necessary.

Table I-1 includes the overall analysis of the total Study Area's infiltration and runoff. Table I-1 also documents the calculation of volumes associated with input and output parameters for the Post-Development condition. These volumes are also expressed in terms of the number of mm of water within each sub-catchment area. The volumes are summed by catchment and for the total property area.

Assumptions incorporated into the water budget for the Post-Development scenario included:

- 1) Impervious surfaces (roads, driveways and buildings) are assumed to have a 10% evaporative loss.
- 2) Runoff is assumed to be conveyed directly to the outlets and not infiltrated.
- 3) Runoff from external sub-catchments is released to the closest on-site sub-catchment, unless otherwise stated.
- 4) The sand filter plunge pool does not infiltrate runoff that it receives.

A summary of the Post-Development water budget calculations is provided in **Table 4**.

5.3.3 POST-DEVELOPMENT INFILTRATION

In the post-development condition, the Site will contain approximately 65,881 m² of impervious surfaces (24.5% impervious). This would result in a net infiltration of 91,350 m³/year or 339.4 mm/yr. Of the total infiltration, 47,067 m³/yr infiltrates directly through pervious areas and 44,283 m³/yr is runoff that infiltrates through the three (3) StormTech infiltration chambers. The net infiltration would reflect approximately 39.6% of the precipitation (857.7 mm/yr).

5.3.4 POST-DEVELOPMENT RUNOFF

The introduction of impervious surfaces will increase the total runoff from the developed area. The total runoff generated by the proposed development area is 65,621 m³/yr or 243.8 mm/year, however, the on-site infiltration trenches will receive and infiltrate approximately 44,283 m³/yr of this runoff which leads to a net runoff generation of 21,338 m³/yr or 79.3 mm/yr. The total calculated Post-Development runoff represents approximately 9.2% of the annual precipitation (857.7 mm/yr).

5.3.5 COMPARISON WITH PRE-DEVELOPMENT

Table 4 provides a comparison of the water budget estimates for the Pre-Development and Post-Development cases with mitigation measures included. The total on-site infiltration is increased by approximately 50% or 30,334 m³/yr. The introduction of additional impervious surfaces, with mitigation measures in place, increases total runoff by 3% or 675 m³/yr.

The estimated runoff to the southeast is predicted to increase by 6% or 1,261 m³/yr while the runoff that previously exited the Site in the southwest corner is reduced to 0 m³/yr. By incorporating the three (3) StormTech infiltration chambers, approximately 67.5% of the runoff generated by the development is now infiltrated.

Runoff and infiltration are maintained in the external catchments as the land use changes for this Site occur on-site. Changes to runoff and infiltration will occur primarily on-site where residence and driveway are constructed and where site re-grading will occur.

The primary objective of the water balance mitigation analysis is to determine whether the annual infiltration to groundwater beneath the development area can be maintained. Given that an infiltration surplus of 30,334 m³/yr exists under post-development conditions, no additional mitigation measures are required at this time.

5.4 WATER QUALITY

The water budget analysis must also consider potential changes to water quality that could be experienced in relation to the proposed development. The following sections describe the typical contaminants associated with the current and future land uses.

5.4.1 EXISTING CONDITIONS

The Site is currently vacant. As such, there are no activities present that could potentially impact groundwater quality at this time.

5.4.2 FUTURE CONDITIONS

The proposed Post-Development condition includes new driveway and roadway areas. These areas may be a future source of contamination to groundwater infiltration or surface water runoff by winter road de-icing agents. The most effective method of reducing potential impacts from salt or other winter road de-icing agents is to minimize the mass/volume of material applied through the use of Best Management Practices (BMPs). Any pervious areas used for winter snow storage may also become potential sources of contamination from winter road de-icing agents. BMPs recommend storing snow on impervious surfaces.

The driveway and roadway areas may also be a potential sources of petroleum hydrocarbons. These are typically contained in vehicles. The release of these substances will typically be the result of accidents. These potential releases could result in impairment of water quality by infiltrating into the groundwater. The risk of an accident occurring at the Site is low considering the only traffic will be the residents who occupy the building.

In pervious areas, soil-enrichment agents (i.e. fertilizers) and/or herbicides may also be a source of contamination. Application of these products should be minimized in order to reduce potential contamination.

6 POLICY AREAS

6.1 WELLHEAD PROTECTION AREAS

The Regional Municipality of York Official Plan (YROP) delineates Wellhead Protection Areas (WHPA) for protection of the groundwater supplies that are used to provide the primary source of potable drinking water to the communities of Aurora, Newmarket, and Ballantrae. In addition to the YROP, a Provincial initiative on Drinking Water Source Protection under *The Clean Water Act*, 2006 has been underway since 2006 to develop Drinking Water Source Protection Plans. The WHPA and vulnerability scores from the Assessment Report for the Lakes Simcoe and Couchiching Source Protection Area are provided as **Figure 13**.

The Site does not lie within delineated WHPA for wells in Aurora or Ballantrae.

Figure 14 illustrates that the entire Site lies within an area designated as WHPA-Q. Policies in the Lakes Simcoe and Couchiching Source Protection Plan for WHPA-Q require that recharge be maintained or enhanced. The water balance calculations presented above demonstrate that the development as proposed, with the stormwater management design as prepared by Sabourin Kimball & Associates Ltd. (2018) will enhance the pre-development infiltration and hence, complies with these policies.

6.2 SIGNIFICANT GROUNDWATER RECHARGE AREAS

Policies 6.36 DP through 6.40 DP of the Lake Simcoe Protection Plan address Significant Groundwater Recharge Areas (SGRA).

The Assessment Report for the Lakes Simcoe and Couchiching Source Protection Area contains mapping of Significant Groundwater Recharge Areas (SGRA). SGRA are regional areas that receive more than the average estimated recharge for a watershed area.

The majority of the Site is not within a mapped SGRA as shown on **Figure 14**. A small portion of the southeast corner of the site that has already been developed is shown to have high sensitivity.

The proposed development design provides for a very minor increase in net off-site run-off and enhancement of on-site recharge. This is not anticipated to negatively impact the features protected by the SGRA or ESGRA policy areas.

6.3 HIGHLY VULNERABLE AQUIFERS

The *Clean Water Act*, 2006, via the Source Protection Plans, and the Oak Ridges Moraine Conservation Plan contain policies that apply to Highly Vulnerable Aquifers. **Figure 15** presents the mapping of Highly Vulnerable Aquifers (HVA) from the Assessment Report for the Lakes Simcoe and Couchiching Source Protection Area. HVA are considered susceptible to contamination of groundwater from activities on the surface or shallow subsurface. The majority of the central and east part of the Site is mapped as a Highly Vulnerable Aquifer. The proposed land use as residential is expected to have minimal potential to affect underlying groundwater resources.

Figure 16 presents the mapping for highly vulnerable aquifers as protected by policies under the Oak Ridges Moraine Conservation Plan. The Site is mapped within an area of High Aquifer Vulnerability.

7 CONCLUSIONS

- (1) WSP Canada Inc. (WSP) was retained by Far Sight Homes to prepare a Hydrogeological Assessment and Water Balance Study for the proposed residential development located at 5426, 5452 and 5584 Lakeshore Road, Ballantrae, Ontario (Site).
 - (2) The proposed development area lies within the Oak Ridges Moraine physiographic region as defined by Chapman and Putnam (1984). The Oak Ridges Moraine is typically characterized by sand or gravel hills with level tracts of sand between them. The area in and surrounding the Site consists of Kame moraines.
 - (3) The Site currently contains a wetland along the southern property boundary adjacent to the manmade pond. The wetland is fed by run-off from the Site and discharges off-site to through the southern property boundary via a culvert underneath Lakeshore Road.
 - (4) Based on the stratigraphy observed during the borehole drilling and test pit excavations at the Site and well records from Ministry of Environment and Climate Change Water Well Information System, the Site is predominantly underlain by alternating layers of sand and silt with isolated layers of fill, silty sand/sandy silt and clayey silt observed in certain boreholes.
 - (5) Based on water elevations from April 2017 that were collected as part of the bi-monthly monitoring program, the groundwater flow direction is to the southeast across the Site. Groundwater levels at the Site fluctuated from a seasonal high of 0.2 m bgs (April 2017) to a seasonal low of 4.57 m bgs (October 2016). The seasonal high was observed at OW16-1 which is located in the area of the realigned drainage channel.
 - (6) In-situ hydraulic conductivity testing was conducted at all six (6) monitoring wells on June 30, 2016/ The results of these test indicate that the hydraulic conductivity of the soil at the Site range from 1.17×10^{-4} m/sec to 1.47×10^{-5} m/sec. These results are consistent with the observed soil descriptions of medium to fine sand in which the monitoring wells are screened.
 - (7) Representative samples of groundwater were collected from the six (6) monitoring wells on June 30, 2016. The results of the test indicated that parameter concentrations are less than Ministry of the Environment and Climate Change (MOECC) Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for All Types of Property Use (Coarse Textured Soil).
 - (8) The Climate-Based Water Budget indicates that average annual precipitation over the past 30 years is 857.7 mm/year. The available moisture surplus at the Site ranges between 283.8 mm/yr to 292.8mm/year depending on the type of soil and vegetation cover. The moisture surplus will reflect the infiltration and runoff based on the soil properties, slopes, and vegetation within individual catchments.
 - (9) Under existing conditions, there are two (2) on-site catchments and three (1) off-site catchment. Runoff generated on-site outlets at two (2) different locations.
 - (a) Runoff from the majority of the Site is directed to the drainage ditch which connects to the existing wetland and discharges over the southern property boundary via a culvert underneath Lakeshore Road.
 - (b) Runoff from a small portion of the site located in the southwest corner flows off-site to the south via overland flow.
- The Pre-Development Water Budget reflects infiltration for the Site of approximately 61,016 m³/yr and runoff from the Site of approximately 20,663 m³/yr.
- (10) The Post-Development Water Budget reflects changes in land use to include increased areas of impervious surfaces (i.e. roads, buildings etc.) and re-grading. Under the proposed development conditions there are ten (10) on-site catchments and three (3) off-site catchment. A significant portion of the runoff is directed to three (3) different StormTech infiltration chambers while the remainder is conveyed to the drainage channels by the proposed storm sewers and/or overland flow. Runoff directed to the drainage channels flows to the existing wetland and is discharge off-site via the culvert underneath Lakeshore road.

- (11) The Post-Development Water Budget predicts a total on-site infiltration of 91,350 m³/yr. Of the total infiltration, 47,067 m³/yr infiltrates through pervious areas and 44,283 m³/yr infiltrates as a result of runoff from developed areas being directed to the on-site infiltration chambers. Overall, this is a increase of 50% relative to the Pre-Development case, and represents an infiltration surplus of 30,334 m³/yr. At this time, additional mitigation measures are not required as there is an infiltration surplus.
- (12) The Post-Development Water Budget predicts a net runoff of 21,338 m³/yr over the Site area. This is an increase of 3% or 675 m³/yr relative to the Pre-Development case. The estimated runoff exiting the Site via the wetland and culvert is predicted to increase by 6% and the runoff directed off-site to the southwest will decrease by 100%.
- (13) The Site lies within an area designated as WHPA-Q. Policies in the Lakes Simcoe and Couchiching Source Protection Plan for WHPA-Q require that recharge be maintained or enhanced. The water balance calculations demonstrate that the development as proposed, with the stormwater management design as prepared by Sabourin Kimball & Associates Ltd. (2018) will enhance the pre-development infiltration and hence, complies with these policies.
- (14) The majority of the Site is not within a mapped SGRA. A small portion of the southeast corner of the site that has already been developed is shown to have high sensitivity. The proposed development design provides for a very minor increase in net off-site run-off and enhancement of on-site recharge. This is not anticipated to negatively impact the features protected by the SGRA or ESGRA policy areas.
- (15) The majority of the central and east part of the Site is mapped as a Highly Vulnerable Aquifer under the Assessment Report for the Lakes Simcoe and Couchiching Source Protection Area as well as the Oak Ridges Moraine Conservation Plan. The proposed land use as residential is expected to have minimal potential to affect underlying groundwater resources.

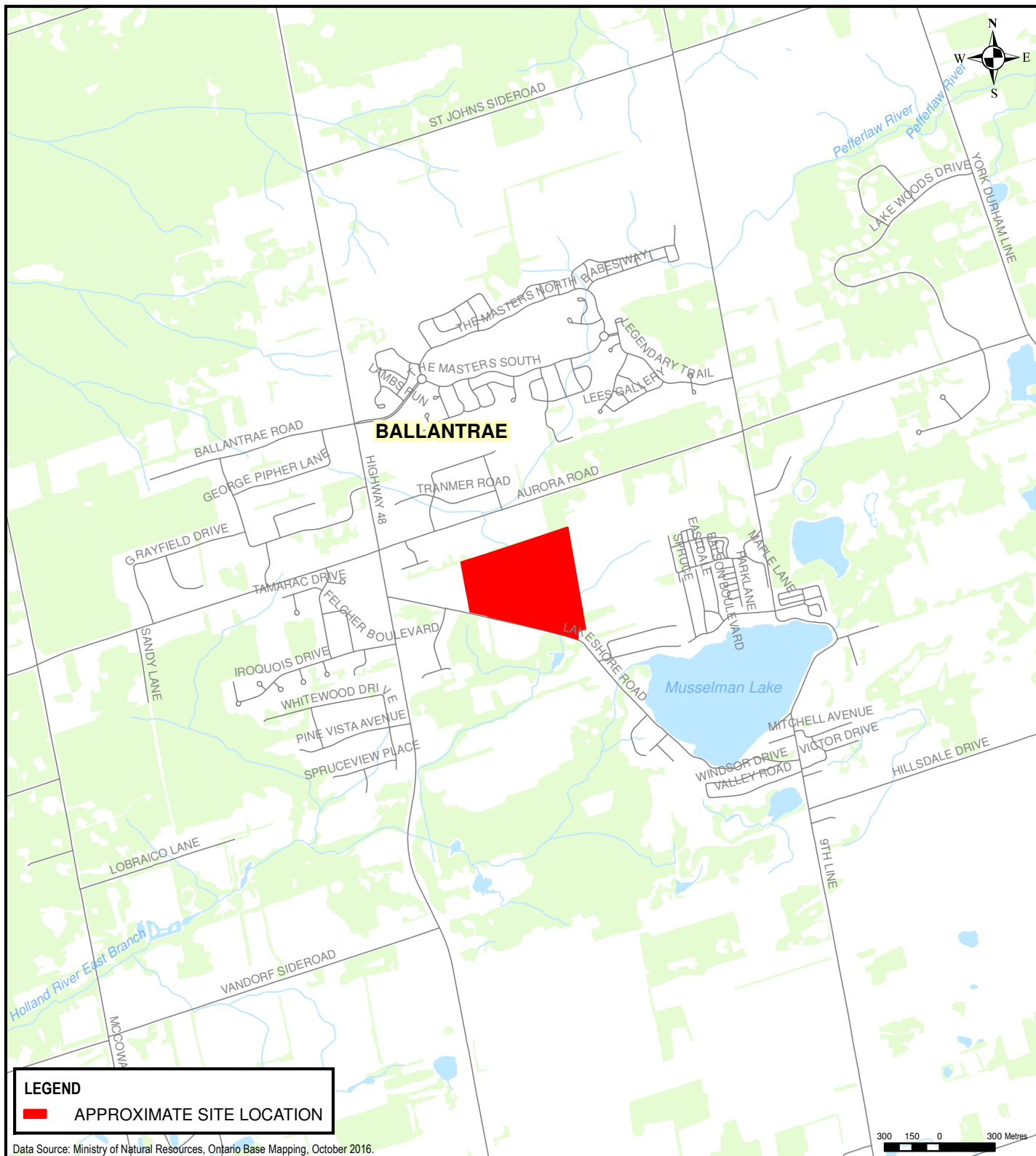
This concludes the Hydrogeological Assessment and Water Balance Study. We trust that this report satisfies your requirements. If you have any questions or concerns regarding this report, do not hesitate to contact our office.

8 REFERENCES

- Chapman, L.J. and D.F. Putnam, 1984. The Physiography of Southern Ontario. Ontario Geological Survey, Third Edition. 270 pp. Accompanied by Map P.2715, Scale 1:600,000.
- Kassenaar, J.D.C. and Wexler, E.J., 2006. Groundwater Modelling of the Oak Ridges Moraine Area. CAMC-YPDT Technical Report #01-06.
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- Locander, Robert, 2009. Analysis of Using Reclaimed Asphalt Pavement (RAP) as a Base Course Material. Report No. CDOT-2009-5
- Federal Highway Administration Research and Technology, 1997. User Guidelines for Waste and Byproduct Materials in Pavement Construction. Publication Number FHWA-RD-97-148.

FIGURES





126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
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PROJECT: HYDROGEOLOGICAL ASSESSMENT AND
WATER BALANCE STUDY
5426, 5452 & 5584 LAKESHORE ROAD
BALLANTRAE, ONTARIO

TITLE: SITE LOCATION MAP

CLIENT: FAR SIGHT HOMES

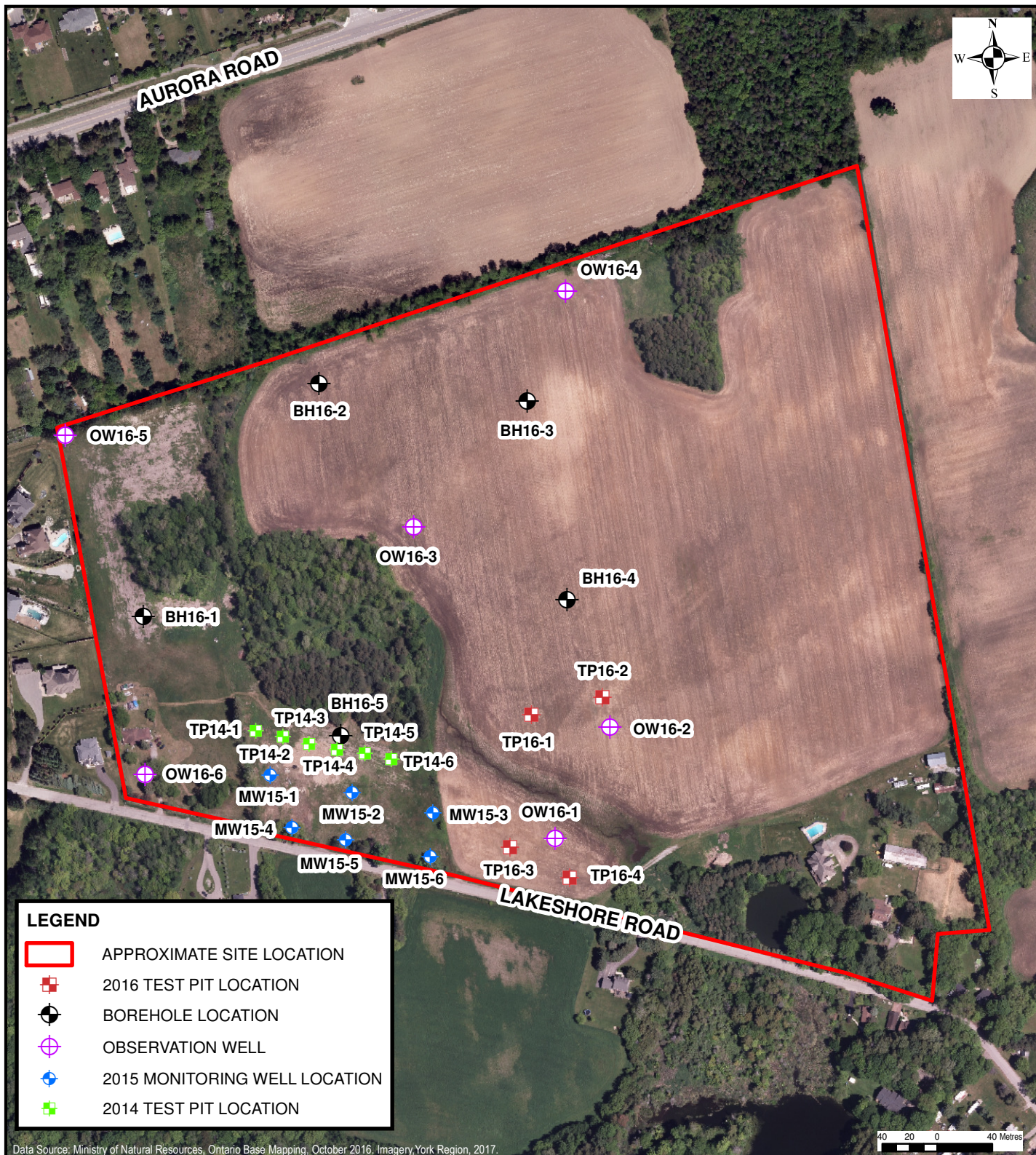
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DRAWN BY: TP
CHECKED BY: LL

PROJECT NO:
161-06960-00 105

DATE:
JUNE 2018

FIGURE NO: 1
REV: -



Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016, Imagery, York Region, 2017.



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TITLE: EXISTING CONDITIONS

CLIENT: FAR SIGHT HOMES

SCALE:

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DRAWN BY:

TP

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PROJECT NO:

161-06960-00 105

DATE:

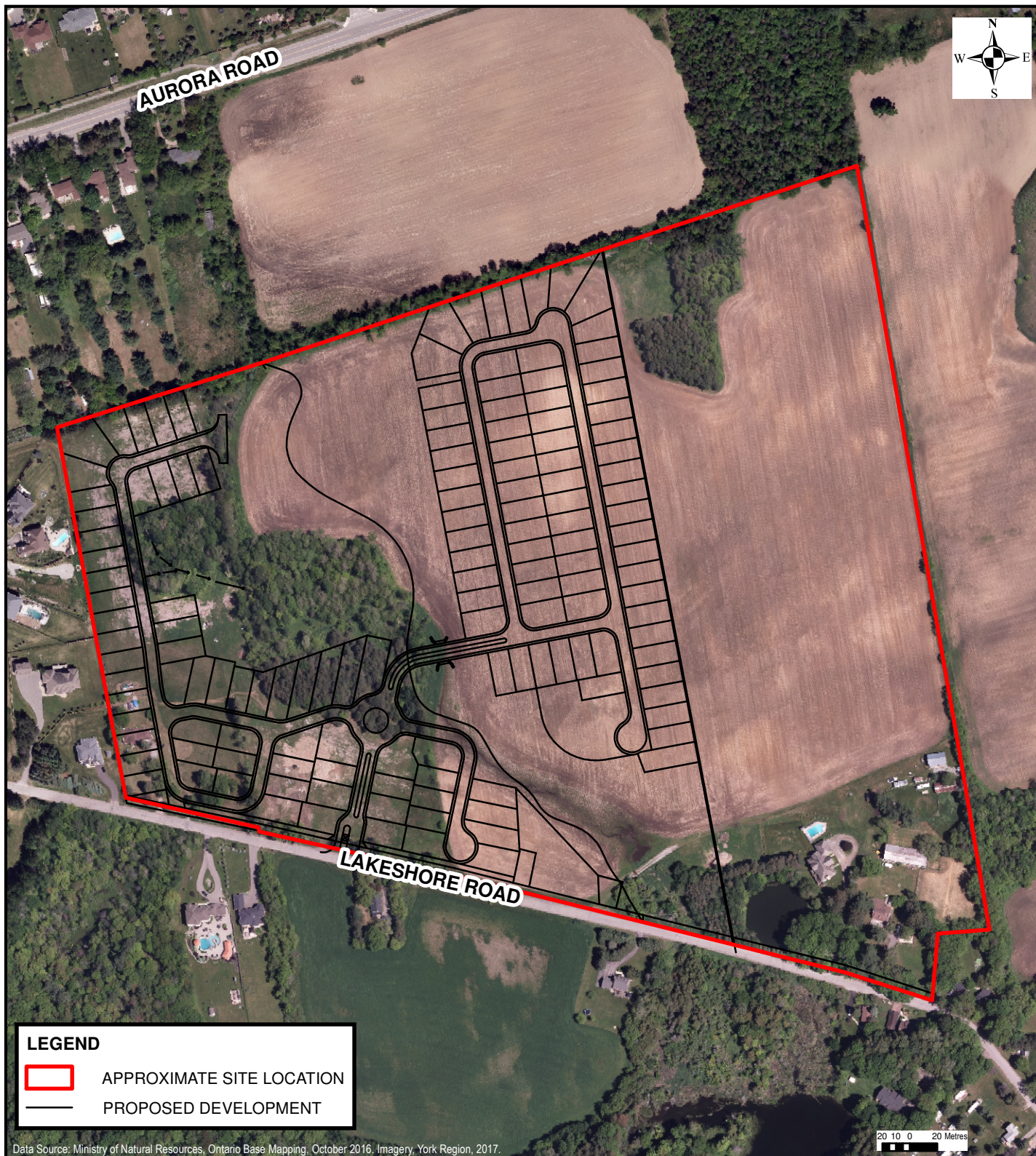
JUNE 2018

FIGURE NO:

2

REV.:

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Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016, Imagery, York Region, 2017.

LEGEND



APPROXIMATE SITE LOCATION



PROPOSED DEVELOPMENT



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HYDROGEOLOGICAL ASSESSMENT AND
WATER BALANCE STUDY
5426, 5452 & 5584 LAKESHORE ROAD
BALLANTRAE, ONTARIO

TITLE:

PROPOSED DEVELOPMENT

CLIENT:

FAR SIGHT HOMES

SCALE:

1:4,000

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PROJECT NO:

161-06960-00 105

DATE:

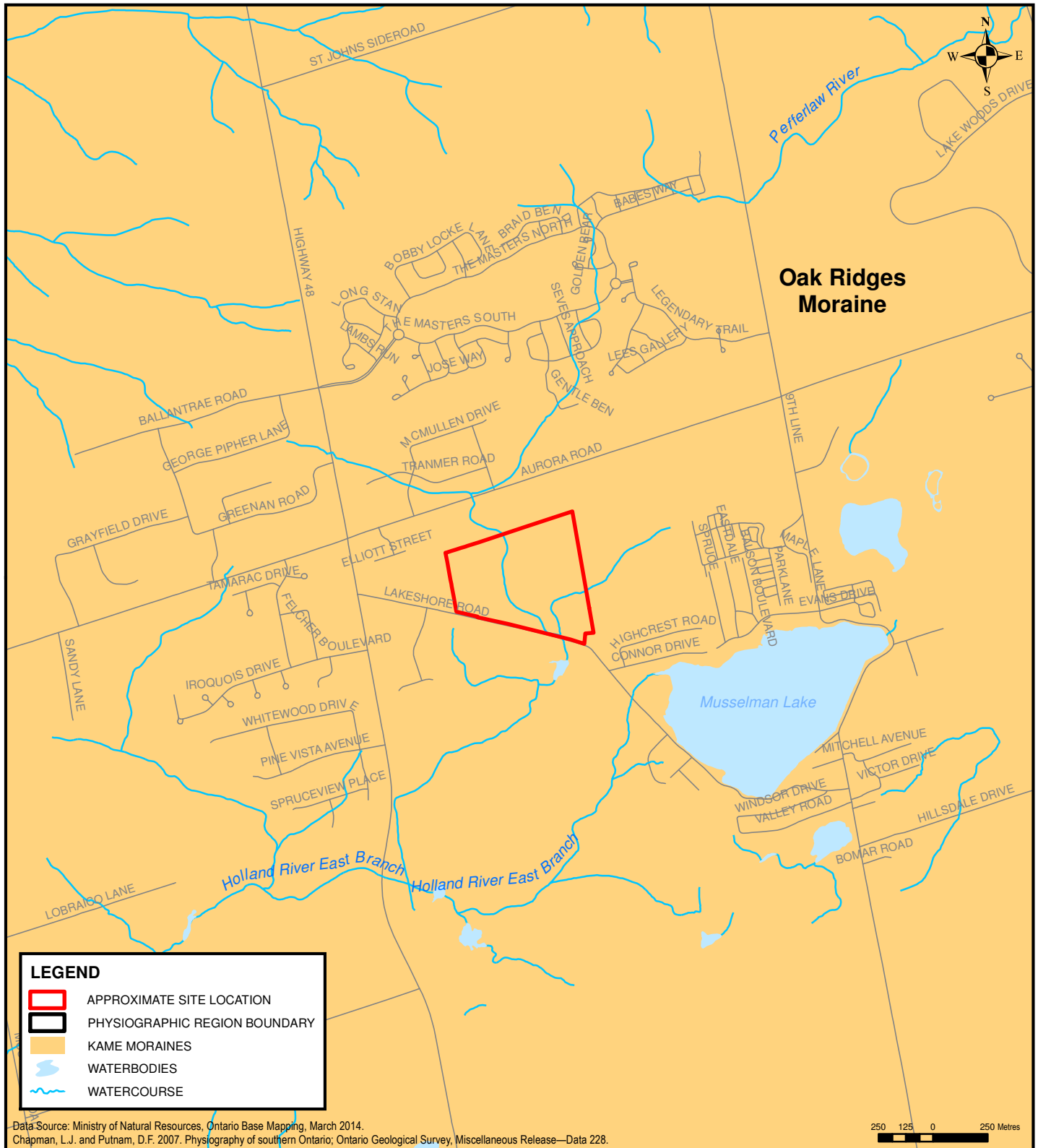
JUNE 2018

FIGURE NO:

3

REV.:

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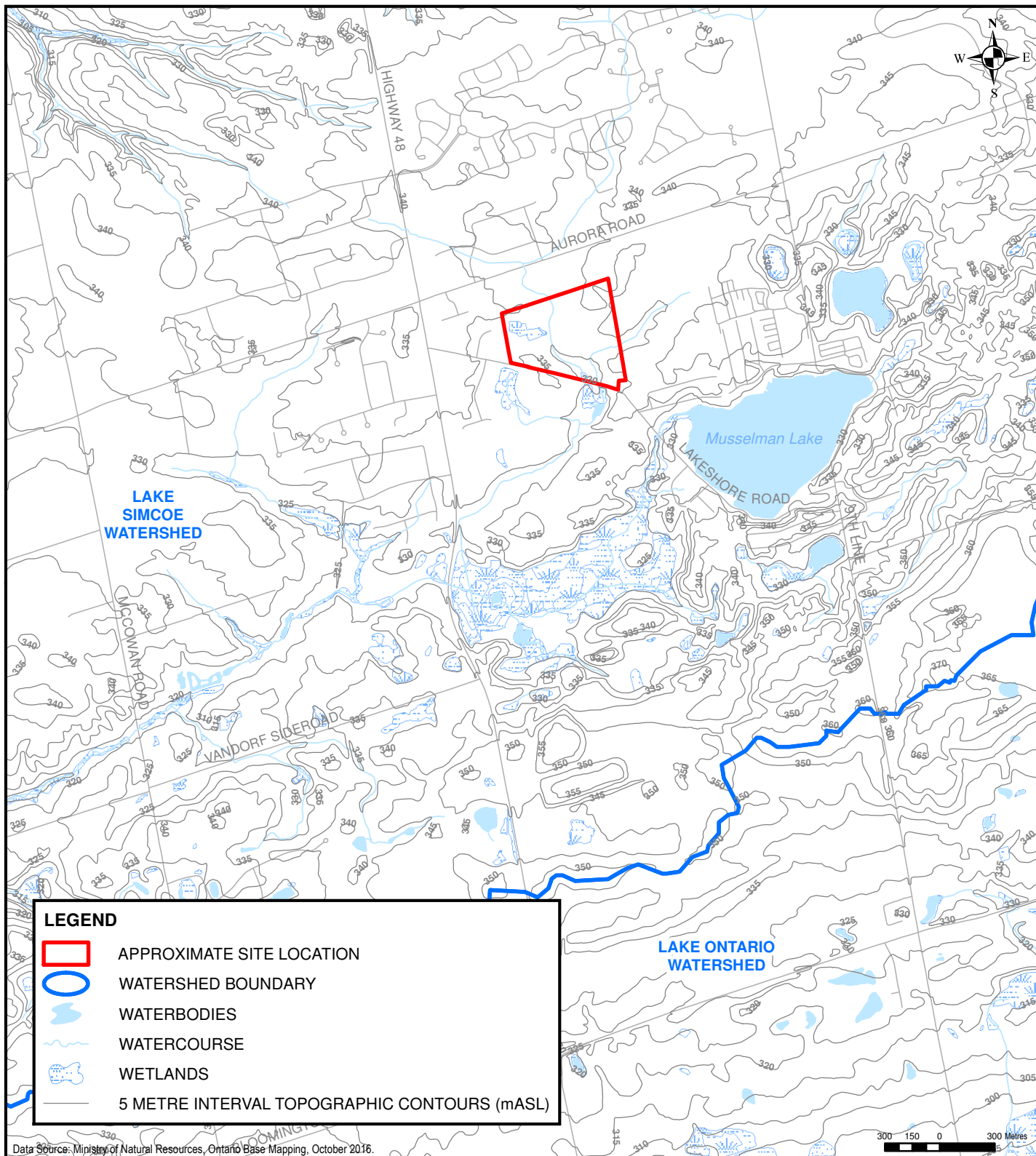


Data Source: Ministry of Natural Resources, Ontario Base Mapping, March 2014.
 Chapman, L.J. and Putnam, D.F. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 228.



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PROJECT:	HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY 5426, 5452 & 5584 LAKESHORE ROAD BALLANTRAE, ONTARIO		SCALE: 1:25,000	
	TITLE: REGIONAL PHYSIOGRAPHY		DRAWN BY: TP	CHECKED BY: LL
			PROJECT NO: 161-06960-00 105	
CLIENT:	FAR SIGHT HOMES		DATE: JUNE 2018	
			FIGURE NO: 4	REV.: -



LEGEND

APPROXIMATE SITE LOCATION

WATERSHED BOUNDARY

WATERBODIES

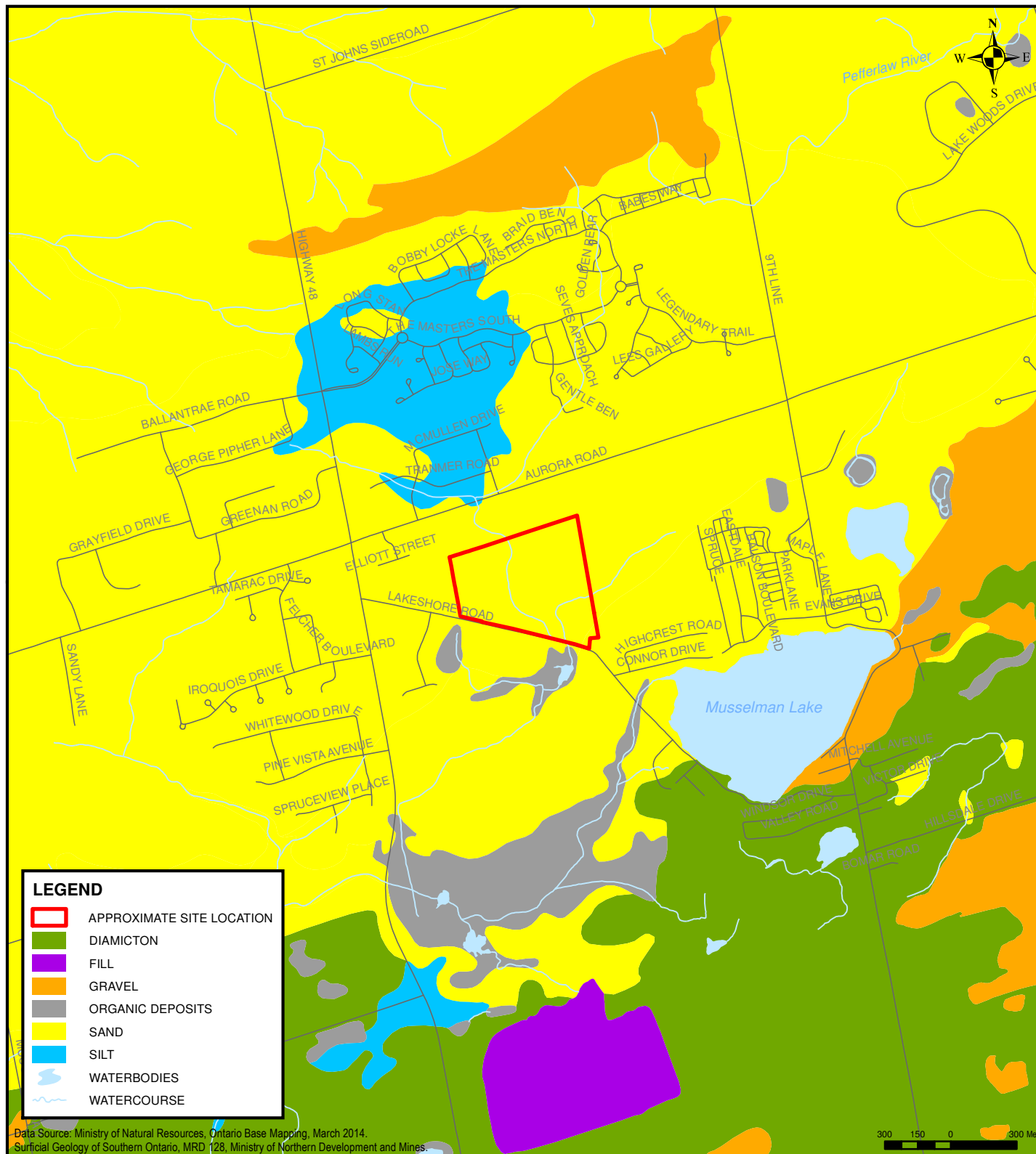
WATERCOURSE

WETLANDS

5 METRE INTERVAL TOPOGRAPHIC CONTOURS (mASL)

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

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	TITLE:	REGIONAL TOPOGRAPHY AND DRAINAGE	DRAWN BY: TP	CHECKED BY: LL
			PROJECT NO: 161-06960-00 105	
			DATE: JUNE 2018	
CLIENT:	FAR SIGHT HOMES	FIGURE NO: 5	REV.: -	



Data Source: Ministry of Natural Resources, Ontario Base Mapping, March 2014.
 Surficial Geology of Southern Ontario, MRD 128, Ministry of Northern Development and Mines.



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 BALLANTRAE, ONTARIO

TITLE: SURFICIAL GEOLOGY

CLIENT: FAR SIGHT HOMES

SCALE:

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DRAWN BY:

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CHECKED BY:

LL

PROJECT NO:

161-06960-00 105

DATE:

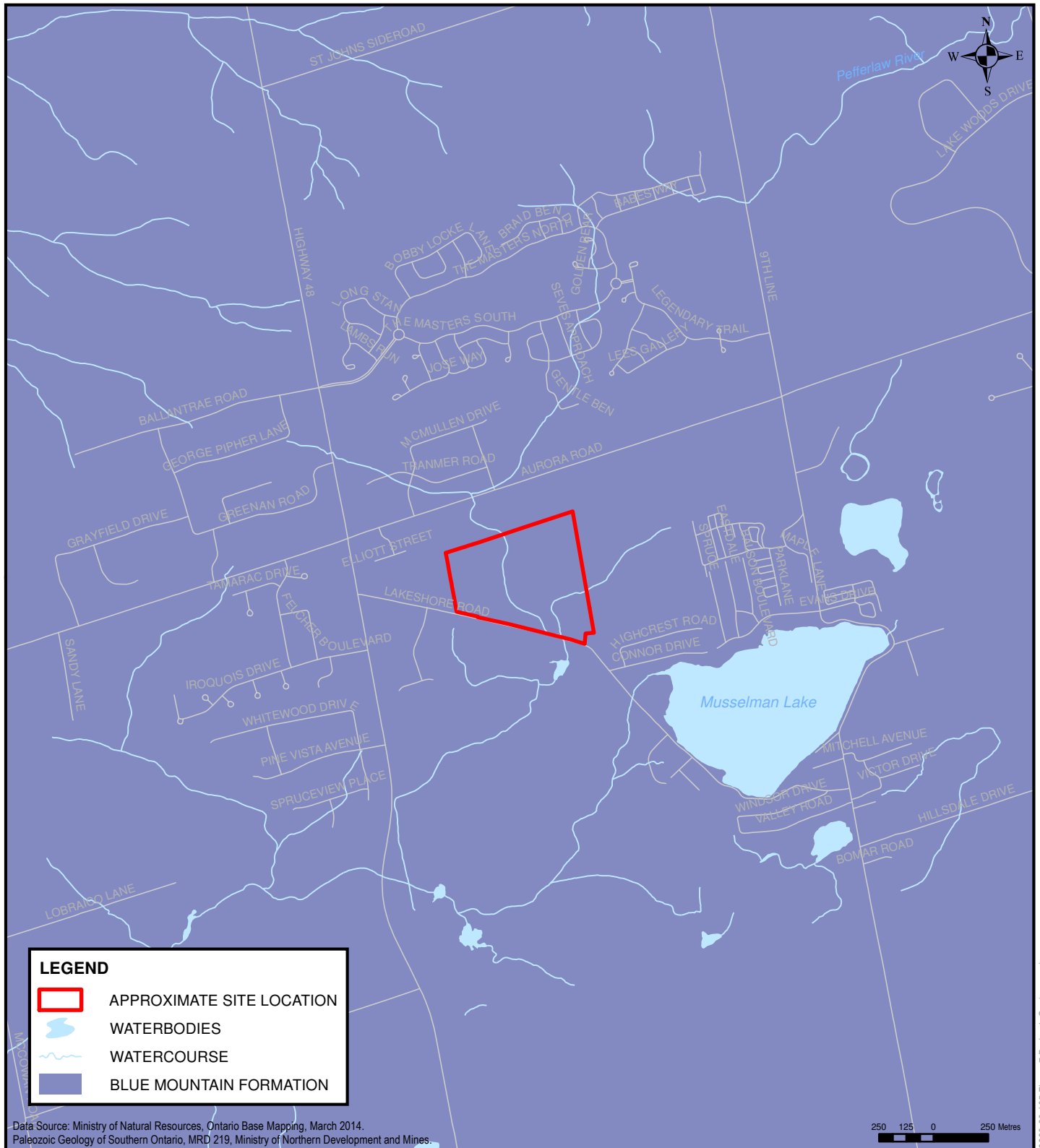
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FIGURE NO:

6

REV.:

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Data Source: Ministry of Natural Resources, Ontario Base Mapping, March 2014.
Paleozoic Geology of Southern Ontario, MRD 219, Ministry of Northern Development and Mines.



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TITLE: BEDROCK GEOLOGY

CLIENT: FAR SIGHT HOMES

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PROJECT NO:

161-06960-00 105

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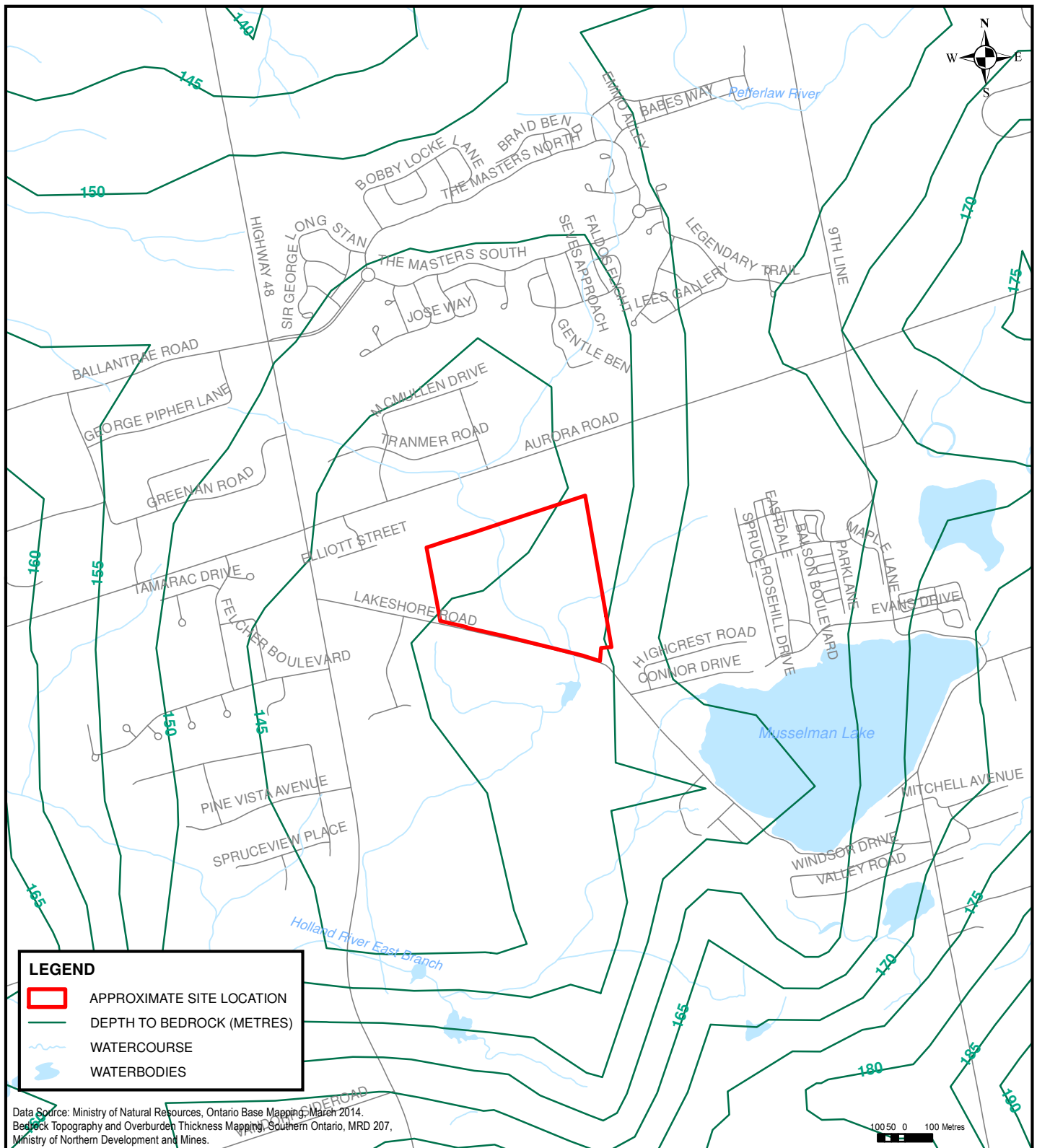
JUNE 2018

FIGURE NO:

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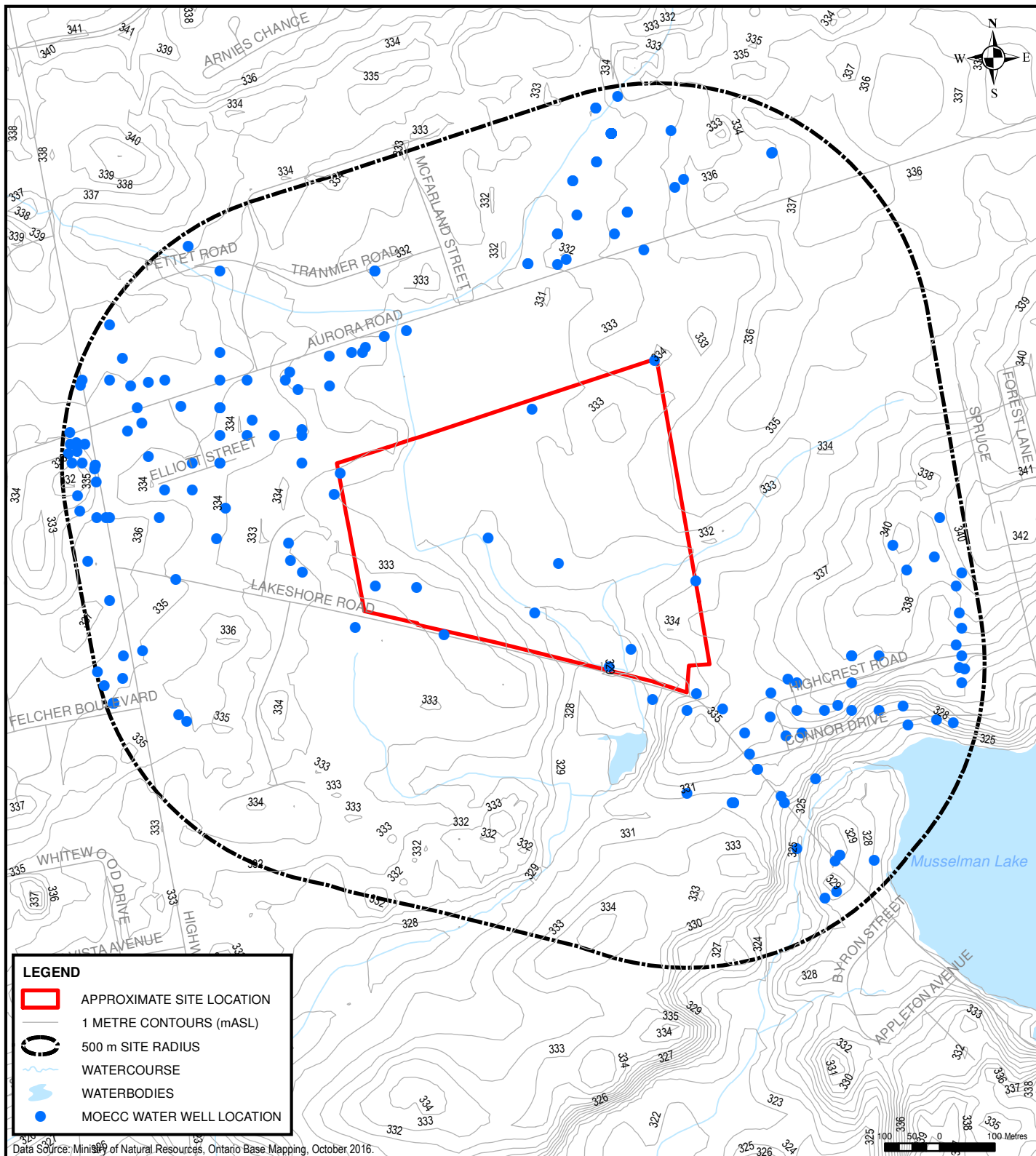
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PROJECT:	HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY 5426, 5452 & 5584 LAKESHORE ROAD BALLANTRAE, ONTARIO	SCALE: 1:20,000	
		DRAWN BY: TP	CHECKED BY: LL
TITLE:	OVERBURDEN THICKNESS	PROJECT NO: 161-06960-00 105	
		DATE: JUNE 2018	
CLIENT:	FAR SIGHT HOMES	FIGURE NO: 8	REV.: -



LEGEND

- APPROXIMATE SITE LOCATION
- 1 METRE CONTOURS (mASL)
- 500 m SITE RADIUS
- WATERCOURSE
- WATERBODIES
- MOC WATER WELL LOCATION

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.



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5426, 5452 & 5584 LAKESHORE ROAD
BALLANTRAE, ONTARIO

TITLE: MOC WATER WELLS

CLIENT: FAR SIGHT HOMES

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PROJECT NO:

161-06960-00 105

DATE:

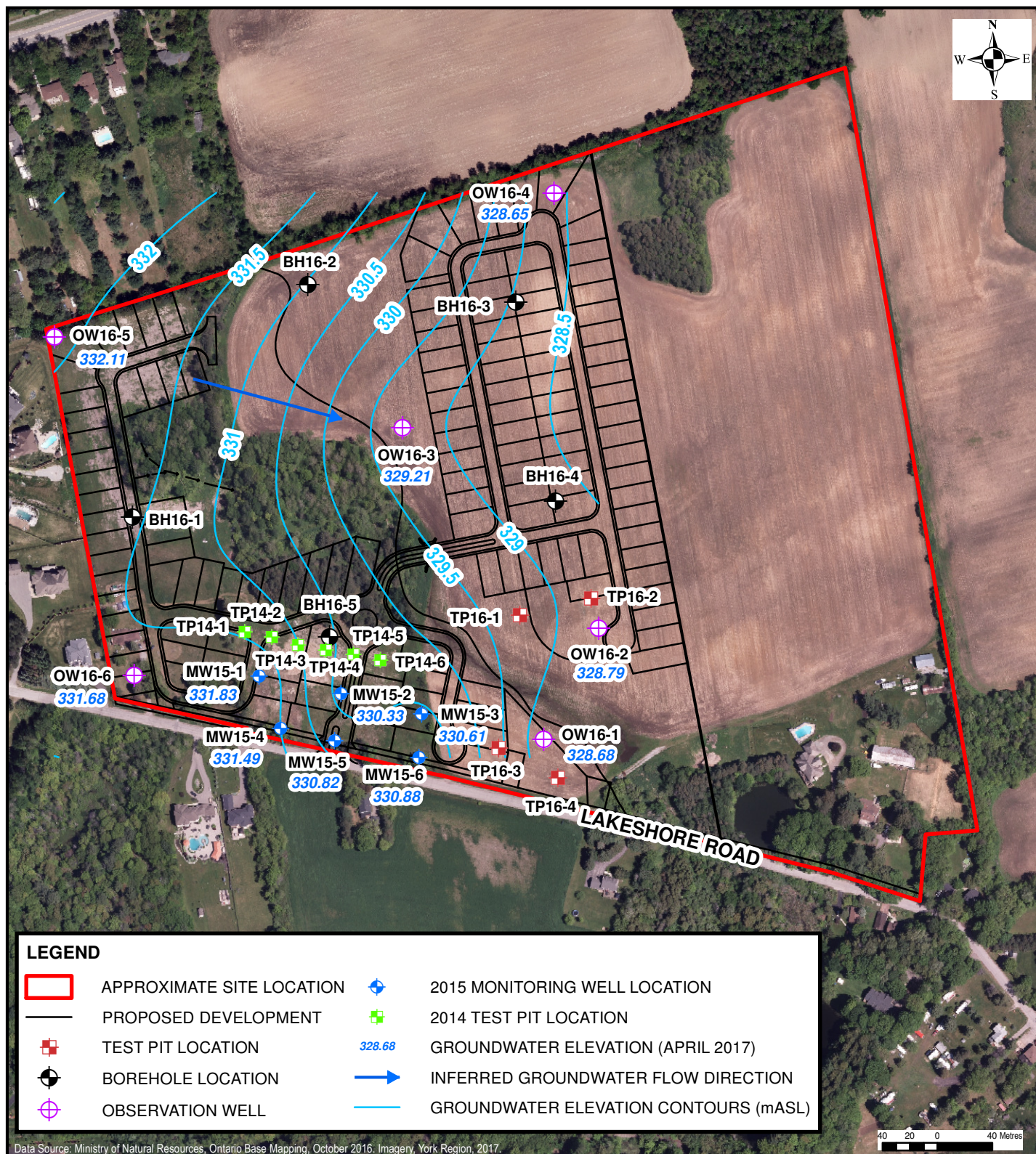
JUNE 2018

FIGURE NO:

9

REV.:

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Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016. Imagery, York Region, 2017.



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PROJECT: HYDROGEOLOGICAL ASSESSMENT AND
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5426, 5452 & 5584 LAKESHORE ROAD
BALLANTRAE, ONTARIO

TITLE: GROUNDWATER ELEVATIONS

CLIENT: FAR SIGHT HOMES

SCALE:

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PROJECT NO:

161-06960-00 105

DATE:

JUNE 2018

FIGURE NO:

10

REV.:

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- LEGEND**
- PRE DEVELOPMENT CATCHMENT AREAS
 - BUILDING
 - CULTIVATED
 - DRIVEWAY
 - GRAVEL
 - LAWNS
 - PATIO
 - PONDS
 - ROAD
 - UNCULTIVATED
 - WOODED AREAS
 - PRE DEVELOPMENT FLOW DIRECTION
 - WATERCOURSE

20 10 0 20 Meters
Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

CLIENT:

FAR SIGHT HOMES

PROJECT:

HYDROGEOLOGICAL ASSESSMENT AND
WATER BALANCE STUDY
5426, 5452 & 5584 LAKESHORE ROAD
BALLANTRAE, ONTARIO

PROJECT NO: 161-06960-00 105	DATE: JUNE 2018
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DESIGNED BY: -

DRAWN BY: T.P.

CHECKED BY: LL

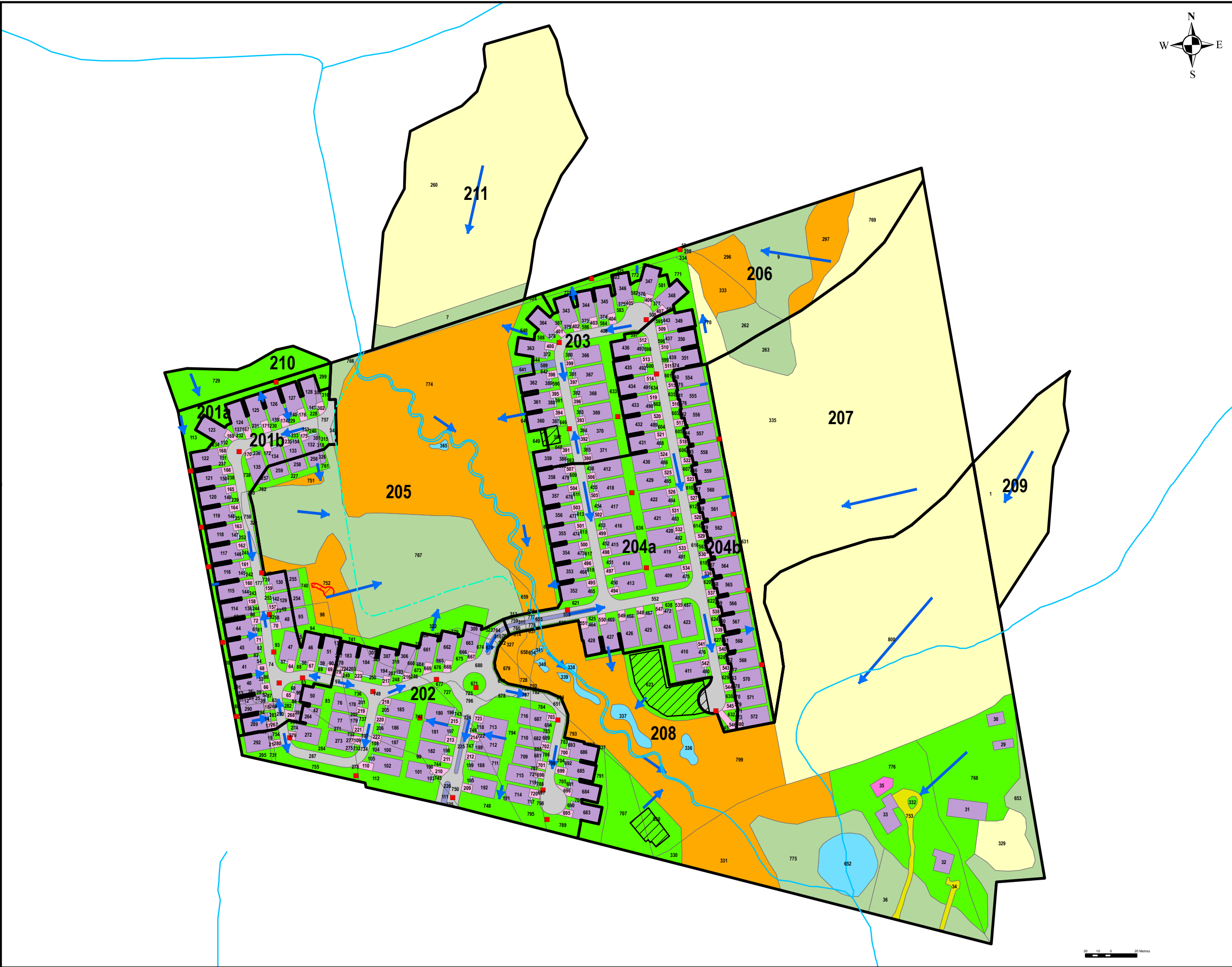
FIGURE NO: 11	SCALE: 1:3,000
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TITLE:

PRE DEVELOPMENT SITE CATCHMENT AREAS

DISCIPLINE: ENVIRONMENT

ISSUE: -	REV.: -
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- LEGEND**
- POST DEVELOPMENT CATCHMENT AREAS
 - BUILDING
 - CONCRETE
 - CULTIVATED
 - DRIVEWAY
 - GRAVEL
 - LAWN
 - PATIO
 - POND
 - PORCH
 - ROAD
 - UNCULTIVATED
 - WOODED AREAS
 - POST DEVELOPMENT FLOW DIRECTION
 - ~ CREEK REALIGNMENT
 - CATCHBASIN
 - DITCH
 - STORMTECH INFILTRATION CHAMBERS
 - SAND FILTER & PLUNGE POOL

CLIENT:

FAR SIGHT HOMES

PROJECT:

HYDROGEOLOGICAL ASSESSMENT AND
WATER BALANCE STUDY
5426, 5452 & 5584 LAKESHORE ROAD
BALLANTRAE, ONTARIO

PROJECT NO:
161-06960-00 105

DATE:
JUNE 2018

DESIGNED BY:
-

DRAWN BY:
T.P.

CHECKED BY:
LL

FIGURE NO:
12

SCALE:
1:3,000

TITLE:

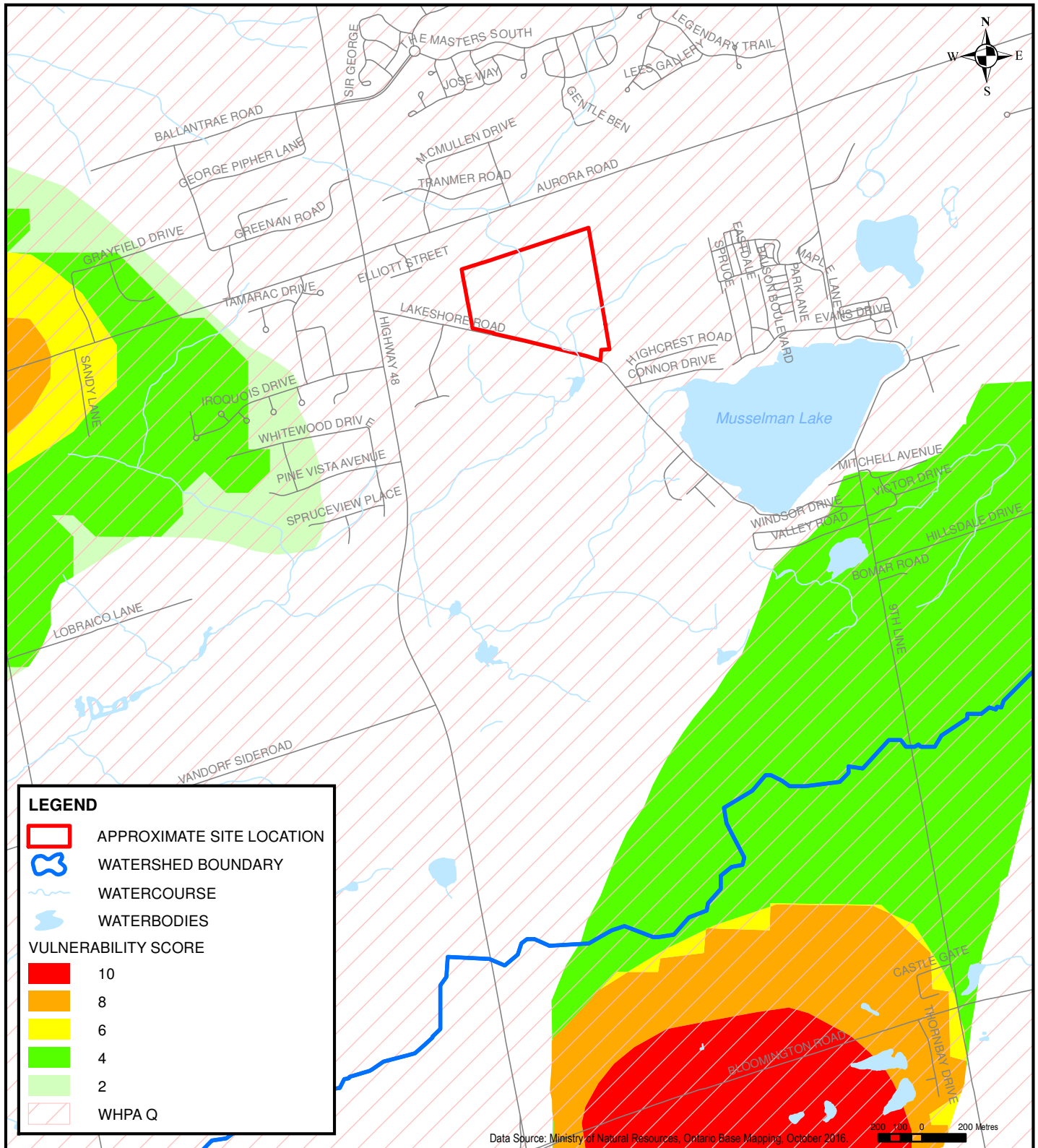
POST DEVELOPMENT SITE CATCHMENT AREAS

DISCIPLINE:

ENVIRONMENT

ISSUE:
-

REV.:
-



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PROJECT: HYDROGEOLOGICAL ASSESSMENT AND
WATER BALANCE STUDY
5426, 5452 & 5584 LAKESHORE ROAD
BALLANTRAE, ONTARIO

TITLE: WELLHEAD PROTECTION AREAS

CLIENT: FAR SIGHT HOMES

SCALE:

1:25,000

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161-06960-00 105

DATE:

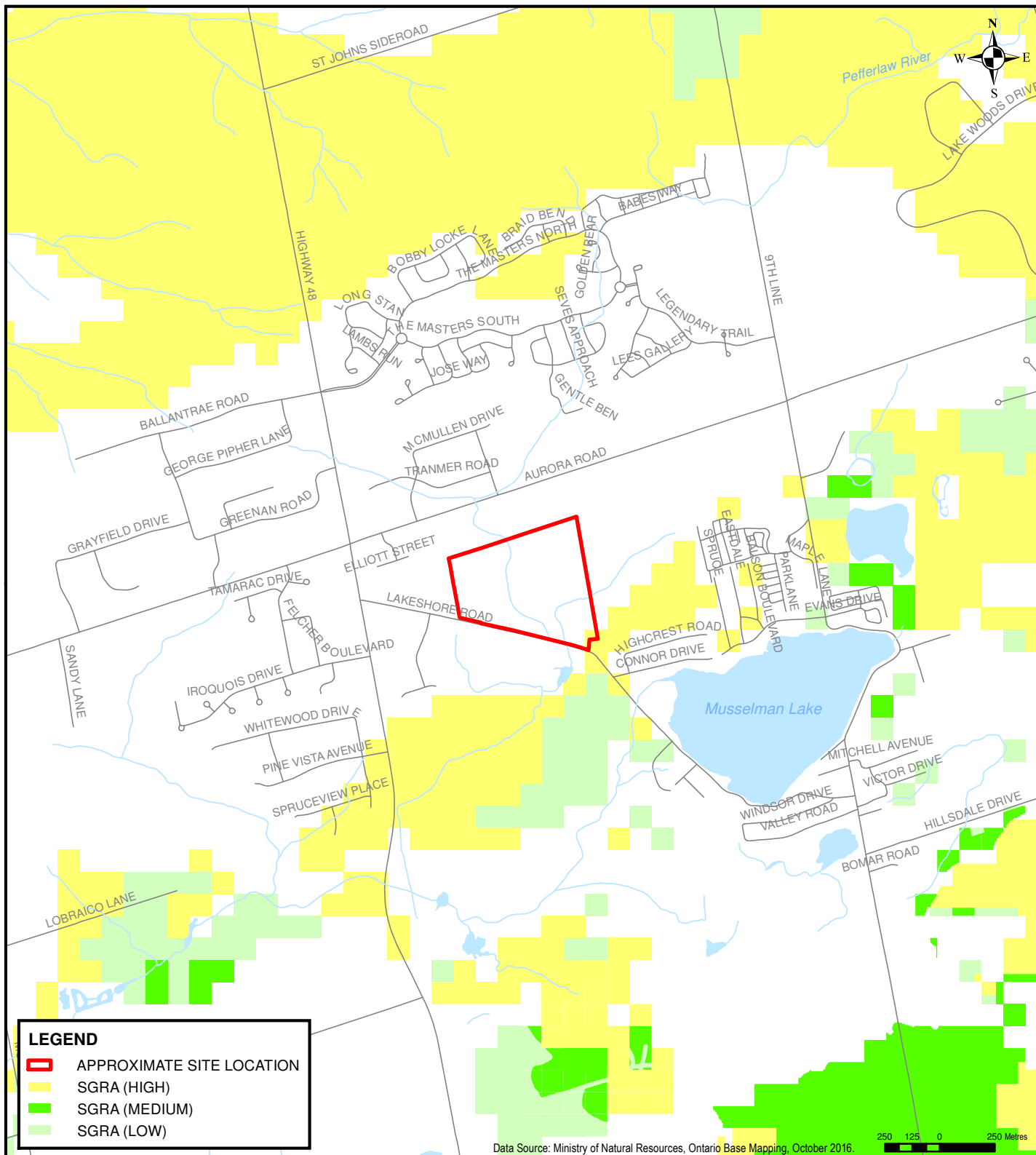
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FIGURE NO:

13

REV.:

-



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PROJECT: HYDROGEOLOGICAL ASSESSMENT AND
WATER BALANCE STUDY
5426, 5452 & 5584 LAKESHORE ROAD
BALLANTRAE, ONTARIO

TITLE: SIGNIFICANT GROUNDWATER RECHARGE AREAS

CLIENT: FAR SIGHT HOMES

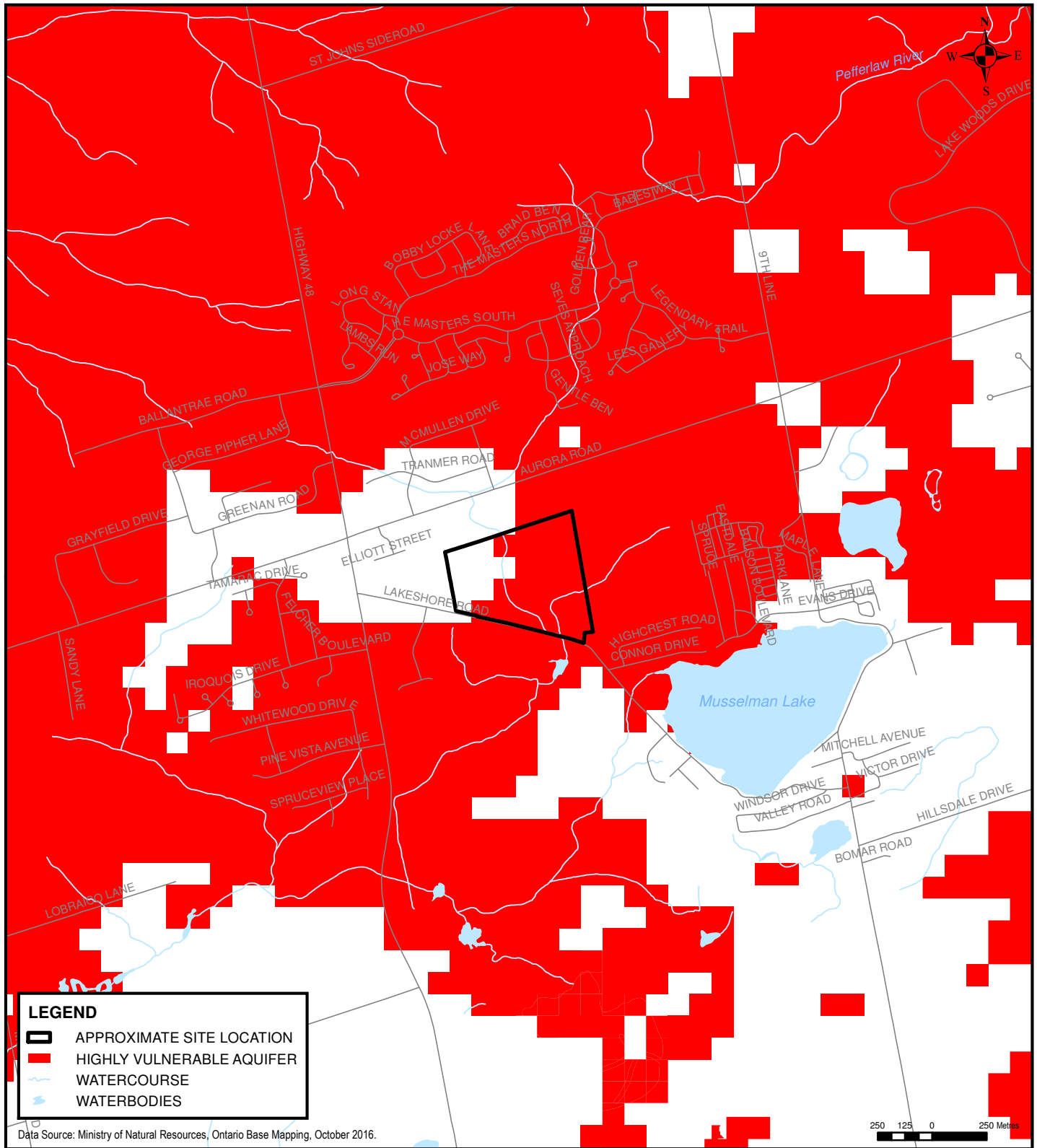
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PROJECT NO: 161-06960-00 105

DATE: JUNE 2018

FIGURE NO: 14 REV: -



Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

250 125 0 250 Meters



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WATER BALANCE STUDY
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BALLANTRAE, ONTARIO

TITLE: HIGHLY VULNERABLE AQUIFERS

CLIENT: FAR SIGHT HOMES

SCALE:

1:25,000

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PROJECT NO:

161-06960-00 105

DATE:

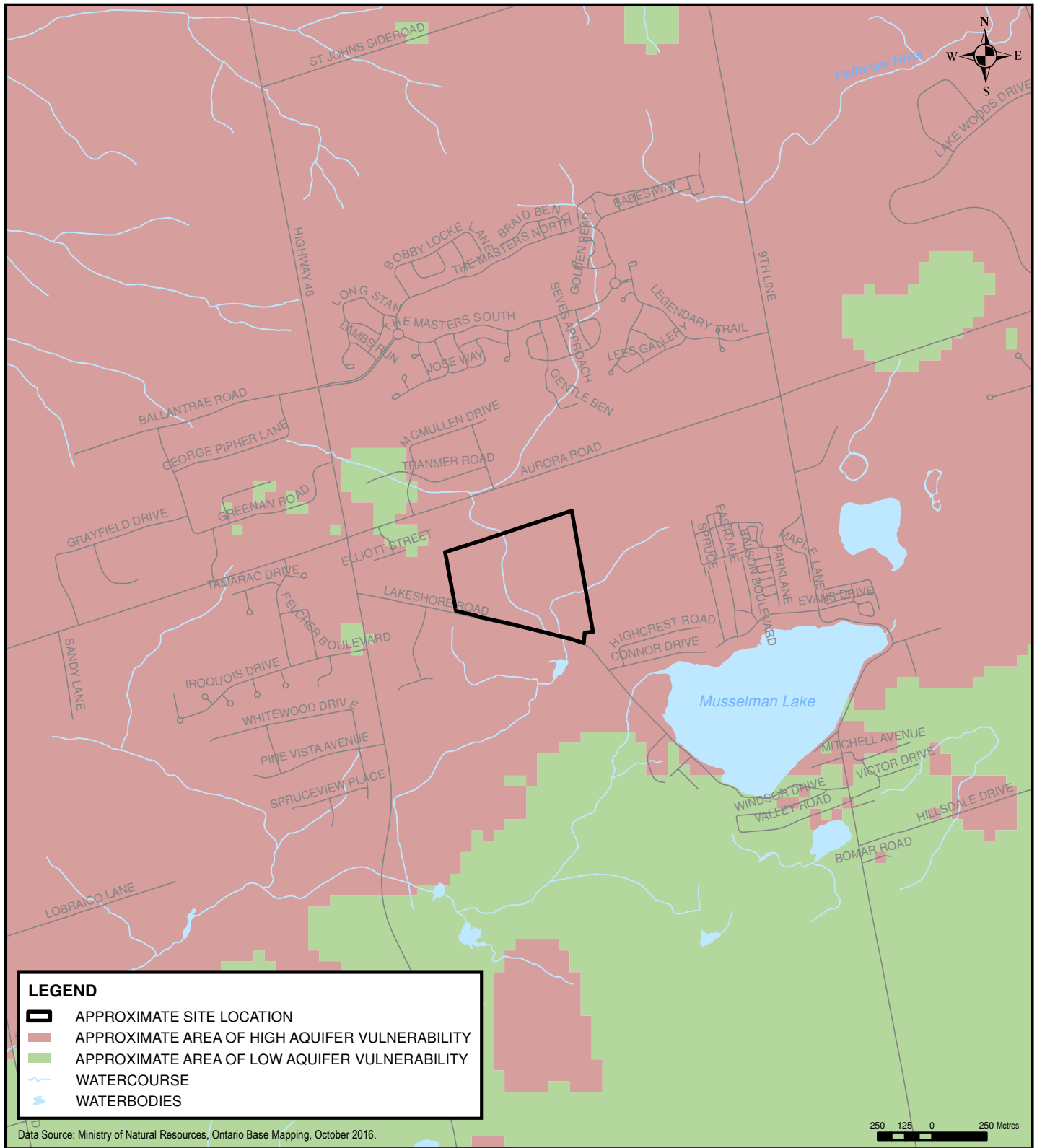
JUNE 2018

FIGURE NO:

15

REV.:

-



LEGEND

- APPROXIMATE SITE LOCATION
- APPROXIMATE AREA OF HIGH AQUIFER VULNERABILITY
- APPROXIMATE AREA OF LOW AQUIFER VULNERABILITY
- WATERCOURSE
- WATERBODIES

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

 126 DON HILLOCK DRIVE, UNIT 2 AURORA, ONTARIO CANADA L4G 0G9 TEL.: 905-750-3080 FAX: 905-727-0463 WWW.WSP.COM	PROJECT: HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY 5426, 5452 & 5584 LAKESHORE ROAD BALLANTRAE, ONTARIO		SCALE: 1:25,000	
	TITLE: OAK RIDGES MORAINÉ AQUIFER VULNERABILITY		DRAWN BY: TP	CHECKED BY: LL
			PROJECT NO: 161-06960-00 105	
			DATE: JUNE 2018	
	CLIENT: FAR SIGHT HOMES	FIGURE NO: 16		REV: -

TABLES



TABLE 1
MONITORING WELL CONSTRUCTION DETAILS
HYDROGEOLOGICAL STUDY AND WATER BUDGET ASSESSMENT
5426, 5452 & 5584 Lakeshore Road, Ballantrae
Town of Whichurch Stouffville, ON

Monitor Designation	Co-ordinates		Diameters		Depth	Elevations									
					Total	Top of Pipe	Ground	Bottom of Borehole	Bottom of Monitor	Screen		Sand Pack		Bentonite Seals	
	Northing	Easting	Borehole	Monitor						Bottom of	Top of	Bottom of	Top of	Bottom of	Top of
	m	m	mm	mm	m bgs	m ASL	m ASL	m ASL	m ASL	m ASL	m ASL	m ASL	m ASL	m ASL	m ASL
OW16-1	635722	4887799	210	51	6.10	329.82	328.88	322.78	322.78	322.78	325.83	322.78	326.48	326.48	328.88
OW16-2	635472	4887940	210	51	6.10	332.29	331.40	325.30	325.30	325.30	328.35	325.30	329.00	329.00	331.40
OW16-3			210	51	6.10	330.99	330.10	324.00	324.00	324.00	327.05	324.00	327.70	327.70	330.10
OW16-4			210	51	6.10	332.29	331.39	325.29	325.29	325.29	328.34	325.29	328.99	328.99	331.39
OW16-5	635563	4887612	210	51	5.20	335.10	334.14	328.04	328.94	328.94	331.99	328.94	332.64	332.64	334.14
OW16-6	635924	4888765	210	51	6.10	334.15	333.19	327.09	327.09	327.09	330.19	327.09	330.69	330.69	333.19

Notes:

- 1) "m agl" indicates metres above ground level.
- 2) "m bgs" indicates metres below ground surface
- 3) "m" indicates metres
- 4) "m ASL" indicates metres above sea level.

TABLE 2
WATER QUALITY RESULTS
HYDROGEOLOGICAL STUDY AND WATER
5426, 5452 & 5584 Lakeshore Road, Ballantrae,
Town of Whichurch-Stouffville, ON

Parameters	UNIT	Table 2 SCS ⁽¹⁾	OW16-1	OW16-2	OW16-3	OW16-4	OW16-5	OW16-6
Sample Date			30-Jun-16	30-Jun-16	30-Jun-16	30-Jun-16	30-Jun-16	30-Jun-16
Water Quality Assessment								
Electrical Conductivity	uS/cm	-	780	570	750	490	470	1100
pH	pH Units	-	7.94	7.93	7.84	8.06	7.92	7.87
Saturation pH	-	-	7.02	7.11	6.81	7.18	7.01	6.80
Langelier Index	-	-	0.916	0.817	1.03	0.876	0.913	1.07
Total Hardness (as CaCO ₃)	mg/L	-	290	300	370	290	280	470
Total Dissolved Solids	mg/L	-	440	350	430	320	280	640
Alkalinity (as CaCO ₃)	mg/L	-	250	180	320	170	240	290
Bicarbonate (as CaCO ₃)	mg/L	-	250	180	320	160	240	280
Carbonate (as CaCO ₃)	mg/L	-	2.0	1.4	2.1	1.8	1.9	2.0
Chloride	mg/L	790	93	24	38	7.3	3.8	160
Nitrate as N	mg/L	-	<0.10	15.0	0.37	14.8	0.60	<0.10
Nitrite as N	mg/L	-	<0.010	<0.010	0.141	0.065	<0.010	<0.010
Sulphate	mg/L	-	10	16	13	20	6.1	15
Ortho Phosphate as P	mg/L	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ammonia as N	mg/L	-	0.30	0.097	0.082	0.49	<0.050	0.088
Total Phosphorus	mg/L	-						
Dissolved Organic Carbon	mg/L	-	3.3	3.0	1.8	1.7	1.9	4.8
Calcium	mg/L	-	110	120	140	110	110	170
Magnesium	mg/L	-	4.7	2.8	5.5	7.1	3.6	7.4
Sodium	mg/L	490	61	2.2	24	3.3	2.5	110
Potassium	mg/L	-	3	3	4	4	<1	1
Aluminum	mg/L	-						
Antimony	mg/L	0.006						
Arsenic	mg/L	0.025						
Barium	mg/L	1						
Beryllium	mg/L	0.004						
Boron	mg/L	5						
Cadmium	mg/L	0.0027						
Chromium	mg/L	0.050						
Cobalt	mg/L	0.0038						
Copper	mg/L	0.087	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron	mg/L	-	0.16	<0.02	0.31	<0.02	<0.02	0.65
Lead	mg/L	0.01						
Manganese	mg/L	-	0.39	0.03	0.65	0.12	0.02	0.15
Molybdenum	mg/L	0.07						
Nickel	mg/L	0.100						
Selenium	mg/L	0.01						
Silicon	mg/L							
Silver	mg/L	0.0015						
Strontium	mg/L	-						
Thallium	mg/L	0.002						
Titanium	mg/L	-						
Uranium	mg/L	0.02						
Vanadium	mg/L	0.0062						
Zinc	mg/L	1.1	<0.01	<0.01	0.01	<0.01	<0.01	<0.01

NOTES

1) Table 2 SCS = Soil, Ground Water and Sediment Standards
for Use Under Part XV.1 of the Environmental Protection Act
(April 2011).

2) Yellow shading indicates parameter reportable detection limit exceeds Table 2 SCS.



TABLE 3 CLIMATIC WATER BUDGET SUMMARY TABLE
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
 5426, 5452, 5584 Lakeshore Road, Ballantrae
 Town of Whitchurch-Stouffville, Ontario

Year of Climate Data Used	Total Adjusted Potential Evapotranspiration	Total Water Surplus	Total Precipitation	Soil Type	Land Use	Water Holding Capacity	Total Actual Evapotranspiration	Total Moisture Surplus used for Water Balance
	mm/yr	mm/yr	mm/yr			mm/yr	mm/yr	mm/yr
CLIMATE NORMAL 1981-2010	584.0	273.7	857.7	Sand Loam	Residential Lawn	150	555.9	301.8
					Cultivated	200	564.9	292.8
					Uncultivated	250	567.9	289.8
					Mature Woodland	400	573.9	283.8

NOTES:

1) Water Holding Capacity obtained from Environmental Design Criteria of the SWM Planning and Design Manual published by the MOE in 2003 (table can be found in Appendix B)

TABLE 4 WATER BUDGET SUMMARY WITH MITIGATION
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

Characteristics		Pre-development		Post-development		Change	
		Volume (m ³ /yr)	mm/yr	Volume (m ³ /yr)	mm/yr	Volume (m ³ /yr)	%
Input	Precipitation	230,841	857.7	230,841	857.7	0	0%
	Run-On	2,482	9.2	2,482	9.2	0	0%
	Total In	233,323	866.9	233,323	866.9	0	0.0%
Output	<i>Infiltration via Pervious Areas</i>	61,016	226.7	47,067	174.9	-13,949	-23%
	<i>Add: Infiltration via Stormtech Systems</i>	0	0.0	44,283	164.5	44,283	>100%
	Total Infiltration	61,016	226.7	91,350	339.4	30,334	50%
	<i>Runoff</i>	20,663	76.8	65,621	243.8	44,958	218%
	<i>Less: Runoff Directed to Stormtech Systems</i>	0	0.0	44,283	164.5	-44,283	<-100%
	Total Runoff	20,663	76.8	21,338	79.3	675	3%
	Evapotranspiration	151,644	563.4	120,635	448.2	-31,009	-20%
	Total Out	233,323	866.9	233,323	866.9	0	0.0%

Off-Site Runoff Change - By Pre-Development Drainage Outlet

Outlet	Description	Contributing Catchments - Pre-Development	Contributing Catchments - Post-Development	Pre-Development		Post-Development		Runoff Change*	
				Area	Volume	Area	Volume	m ³	%
				m ²	m ³	m ²	m ³		
Off-Site South East	Flows off-site to the southeast via the creek.	Catchment A	Catchments 201a, 201b, 205 and 209	262,459	20,077	145,220	21,338	1,261	6%
Off-Site South West	Flows off-site to the southwest via overland flow.	Catchment B	None	6,680	586	0	0	-586	-100%
Stormtech 3 Infiltration Chamber	Infiltration through Stormtech 3 infiltration chamber in sub-catchment 203-592.	None	Catchments 203 and 208	0	0	25,612	7,360	7,360	>100%
Stormtech 4 Infiltration Chamber	Infiltration through Stormtech 4 infiltration chamber in sub-catchment 209-623.	None	Catchments 204a, 204b and 207	0	0	72,087	23,115	23,115	>100%
Stormtech 7 Infiltration Chamber	Infiltration through Stormtech 7 infiltration chamber in sub-catchment 209-650.	None	Catchment 202	0	0	26,221	13,809	13,809	>100%
Total				269,139	20,663	269,139	65,621	44,958	218%

*The total runoff change represents the additional amount of runoff generated by impervious surfaces in the post-development scenario but does not represent the actual change in runoff since a large portion is infiltrated through the Stormtech infiltration chambers.

Breakdown of Post-Development Run-Off by Land Use

Land Use	Description	Post-Development		Runoff
		Area	Volume	
		m ²	m ³	m ³
Total Buildings	Includes residential homes.	42,570	32,861	32,861
Paved Areas	Includes roads, patios, porches and driveways.	23,311	17,995	17,995
Impervious Areas		65,881	50,856	50,856
Pervious Areas	Includes residential lawns, gravel, uncultivate, cultivated and wooded areas.	203,258	14,766	14,766
Pervious Areas		203,258	14,766	14,766
TOTAL RUN-OFF		269,139	65,621	65,621

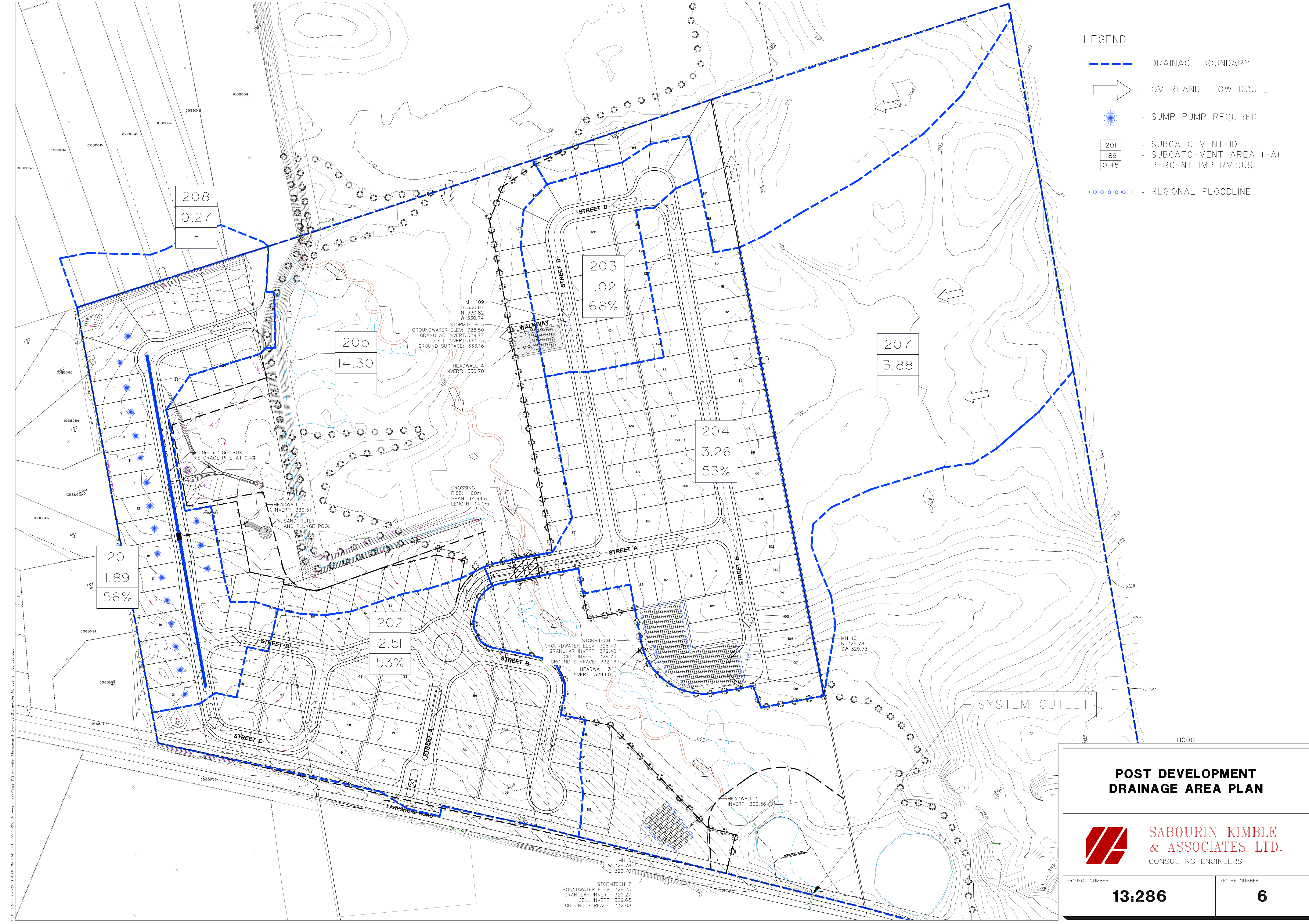
APPENDIX

A

STORMWATER MANAGEMENT PLAN

LEGEND

- DRAINAGE BOUNDARY
- OVERLAND FLOW ROUTE
- SUMP PUMP REQUIRED
- 201
1.89
56%
- SUBCATCHMENT ID
- SUBCATCHMENT AREA (HA)
- PERCENT IMPERVIOUS
- REGIONAL FLOODLINE



POST DEVELOPMENT DRAINAGE AREA PLAN



**SABOURIN KIMBLE
& ASSOCIATES LTD.**
CONSULTING ENGINEERS

PROJECT NUMBER

13:286

FIGURE NUMBER

6

APPENDIX

B

MOECC WATER WELL RECORDS

Appendix C - Summary of MOECC Water Well Records within 500 m
5426, 5452 & 5584 Lakeshore Road, Ballantrae, ON
Town of Whitchurch-Stouffville

Well ID	Coordinates		Elevation (m)	Depth (m)	Water Level (m)	Water Yield (Lpm)	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y							(m)	(m)				
1907350	637530.6	4877209	334.978942	55.1688	7.01	22.73045	Water Supply	Domestic+	0.00	2.44	BROWN	SAND	CLAY	
									2.44	11.58	BROWN	CLAY	SOFT	
									11.58	17.07	BROWN	SILT	WATER-BEARING	
									17.07	27.43	GREY	SILT	WATER-BEARING	
									27.43	40.54	GREY	CLAY	SILT	WATER-BEARING
									40.54	50.90	GREY	SILT	GRAVEL	WATER-BEARING
									50.90	53.34	GREY	SAND	GRAVEL	WATER-BEARING
									53.34	55.17	BROWN	SAND	GRAVEL	WATER-BEARING
6908306	637531.6	4877004	334.796844	22.86	2.7432	13.63827	Water Supply	Domestic	0.00	0.91		FINE SAND		
									0.91	3.05	GREY	CLAY		
									3.05	20.73		FINE SAND		
									20.73	22.86		MEDIUM SAND		
6908307	637619.6	4876933	336.035339	16.1544	13.41120	22.73045	Water Supply	Domestic	0.00	16.15		FINE SAND		
6908308	637412.6	4877084	328.987609	22.2504	3.6576	18.18436	Water Supply	Domestic	0.00	0.30		TOPSOIL		
									0.30	3.66		CLAY		
									3.66	18.59		MEDIUM SAND		
									18.59	22.25		MEDIUM SAND		
6908313	636584.6	4877211	337.095886	19.5072	12.192	18.18436	Water Supply	Domestic	0.00	6.10		PREVIOUSLY DUG		
									6.10	12.19	BROWN	CLAY		
									12.19	19.51		FINE SAND		
6908316	637579.6	4876977	336.360473	15.24	11.5824	18.18436	Water Supply	Domestic	0.00	15.24		MEDIUM SAND		
6908318	636911.6	4877124	333.458984	14.3256	10.9728	13.63827	Water Supply	Domestic	0.00	14.33		COARSE SAND		
6908320	636815.6	4877224	334.129791	41.148	9.144	9.09218	Water Supply	Domestic	0.00	4.88		PREVIOUSLY DUG		
									4.88	12.19		CLAY	FINE SAND	
									12.19	18.29		FINE SAND		
									18.29	27.43	BLUE	CLAY		
									27.43	35.05		CLAY	MEDIUM SAND	
									35.05	41.15	BLUE	FINE SAND		
6908321	636807.6	4877556	334.979339	17.3736	7.62	0	Water Supply	Domestic	0.00	7.62		PREVIOUSLY DUG		
									7.62	14.33	YELLOW	CLAY	SILT	
									14.33	17.37	RED	FINE SAND		
									0.00	7.32		PREVIOUSLY DUG		

Appendix C - Summary of MOECC Water Well Records within 500 m
5426, 5452 & 5584 Lakeshore Road, Ballantrae, ON
Town of Whitchurch-Stouffville

Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
6908322	636658.6	4877286	335.528747	70.104	2.7432	22.73045	Test Hole	Not Used	7.32	19.81	BROWN	MEDIUM SAND	SILT	
									19.81	70.10		QUICKSAND	CLAY	
6910269	636924.6	4877623	331.815948	9.144	6.096	22.73045	Water Supply	Domestic	0.00	0.30	BLACK	TOPSOIL	MEDIUM SAND	
									0.30	9.14	RED	MEDIUM SAND		
6910343	637004.6	4877663	330.422821	24.6888	6.096	22.73045	Water Supply	Domestic	0.00	7.62	BROWN	MEDIUM SAND	CLAY	
									7.62	21.64	BLUE	SILT	CLAY	
									21.64	24.69	GREY	FINE SAND		
6910344	636964.6	4877653	331.290435	25.2984	6.4008	27.27654	Water Supply	Domestic	0.00	7.62	BROWN	MEDIUM SAND	CLAY	
									7.62	22.25	BLUE	SILT	CLAY	
									22.25	25.30	GREY	FINE SAND		
6910345	636929.6	4877633	331.653472	24.384	6.096	36.36872	Water Supply	Domestic	0.00	10.97	BROWN	MEDIUM SAND	CLAY	
									10.97	21.64	BLUE	SILT	CLAY	
									21.64	24.38	GREY	FINE SAND		
6910538	636904.6	4877623	332.273437	26.5176	6.4008	27.27654	Water Supply	Domestic	0.00	4.88	BROWN	MEDIUM SAND		
									4.88	5.79	BROWN	CLAY		
									5.79	15.85	BROWN	MEDIUM SAND		
									15.85	16.46	GREY	MEDIUM SAND		
									16.46	19.51	GREY	CLAY	GRAVEL	
									19.51	20.12	GREY	MEDIUM SAND		
									20.12	21.03	GREY	CLAY		
									21.03	23.16	GREY	MEDIUM SAND		
									23.16	24.69	GREY	SILT		
6910730	636864.6	4877563	333.999969	25.908	6.7056	9.09218	Water Supply	Domestic	24.69	26.52	BROWN	MEDIUM SAND		
									0.00	1.22	BROWN	MEDIUM SAND		
									1.22	3.05	BROWN	MEDIUM SAND	CLAY	
									3.05	8.53	BROWN	CLAY	GRAVEL	
									8.53	14.94	BROWN	FINE SAND		
									14.94	17.37	GREY	MEDIUM SAND	CLAY	
									17.37	21.03	GREY	CLAY		
									21.03	24.38	GREY	SILT		
6910818	636814.6	4877483	335.244171	10.668	6.096	22.73045	Water Supply	Domestic	24.38	25.91	BROWN	MEDIUM SAND		
									0.00	0.30		TOPSOIL	MEDIUM SAND	
									0.30	6.71	BROWN	FINE SAND	CLAY	
6911078	636604.6	4876953	335.685699	32.9184	6.096	45.4609	Water Supply	Domestic	6.71	10.67	BROWN	MEDIUM SAND		
									0.00	6.10	BROWN	SAND		
									6.10	10.97	BROWN	CLAY		
									10.97	29.87	GREY	CLAY	SILT	
6912956	637072.6	4877111	335.056365	22.86	15.24	36.36872	Water Supply	Domestic	29.87	32.92	GREY	SAND		
									0.00	5.18		PREVIOUSLY DUG		
									5.18	13.72	BROWN	FINE SAND		
									13.72	19.81	BROWN	CLAY	SAND	

Appendix C - Summary of MOECC Water Well Records within 500 m
5426, 5452 & 5584 Lakeshore Road, Ballantrae, ON
Town of Whitchurch-Stouffville

Well ID	Coordinates		Elevation (m)	Depth (m)	Water Level (m)	Water Yield (Lpm)	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y							(m)	(m)				
									19.81	22.86	BROWN	FINE SAND		
6913612	636554.6	4877323	336.25476	33.528	4.8768	18.18436	Water Supply	Domestic	0.00	3.66	BROWN	CLAY		
									3.66	6.71	BROWN	COARSE SAND		
									6.71	24.38	BROWN	CLAY	SAND	
									24.38	32.61	BLUE	CLAY		
									32.61	33.53	GREY	FINE SAND		
6913839	636784.6	4877573	335.005065	12.192	11.5824	22.73045	Water Supply	Domestic	0.00	0.61		TOPSOIL		
									0.61	5.49	BROWN	CLAY	SANDY	
									5.49	6.10		SAND		
									6.10	12.19	BROWN	CLAY	SANDY	
6913958	637514.6	4876823	334.196075	15.8496	11.5824	27.27654	Water Supply	Domestic	0.00	0.61	BLACK	TOPSOIL		
									0.61	9.14	BROWN	CLAY	STONES	
									9.14	12.19	BLUE	CLAY		
									12.19	15.85	BROWN	SAND		
6914298	636664.6	4877473	336.559387	31.3944	12.192	22.73045	Water Supply	Domestic	0.00	3.96	BROWN	SAND		
									3.96	8.53	YELLOW	CLAY		
									8.53	19.81	BROWN	SILT	CLAY	
									19.81	26.21	GREY	CLAY		
									26.21	28.04	GREY	SILT		
									28.04	29.57	GREY	CLAY		
6914300	636714.6	4877473	336.552886	33.528	11.5824	22.73045	Water Supply	Domestic	29.57	31.39	BROWN	SAND	WATER-BEARING	
									0.00	3.96	BROWN	SAND		
									3.96	9.14	YELLOW	CLAY		
									9.14	20.42	BROWN	SILT	CLAY	
									20.42	27.43	GREY	CLAY		
									27.43	29.26	GREY	SILT		
									29.26	32.00	GREY	CLAY		
6914301	636664.6	4877523	337.079132	32.3088	12.4968	40.91481	Water Supply	Domestic	32.00	33.53	BROWN	SAND	WATER-BEARING	
									0.00	3.66	BROWN	SAND		
									3.66	8.23	YELLOW	CLAY	SAND	
									8.23	20.73	BROWN	SILT	CLAY	
									20.73	27.43	GREY	CLAY		
									27.43	28.65	GREY	SILT		
									28.65	30.48	GREY	CLAY		
6914306	636764.6	4877473	335.989959	30.1752	11.8872	31.82263	Water Supply	Domestic	30.48	32.31	BROWN	SAND	WATER-BEARING	
									0.00	4.88	BROWN	SAND		
									4.88	10.36	YELLOW	CLAY		
									10.36	20.42	BROWN	SILT	CLAY	
									20.42	28.35	GREY	CLAY		
									28.35	30.18	BROWN	SAND		
									0.00	6.10	BROWN	SAND		

Appendix C - Summary of MOECC Water Well Records within 500 m
5426, 5452 & 5584 Lakeshore Road, Ballantrae, ON
Town of Whitchurch-Stouffville

Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
6914307	636564.6	4877373	335.602752	34.1376	12.192	18.18436	Water Supply	Domestic	6.10	9.45	YELLOW	CLAY		
									9.45	19.51	BROWN	SILT	CLAY	
									19.51	27.43	GREY	CLAY		
									27.43	29.26	GREY	SILT		
									29.26	32.61	GREY	CLAY		
									32.61	34.14	BROWN	SAND		
6914555	636614.6	4877373	335.578369	33.528	11.5824	31.82263	Water Supply	Domestic	0.00	5.18	BROWN	SAND		
									5.18	9.75	YELLOW	CLAY	SAND	
									9.75	20.73	BROWN	SILT	CLAY	
									20.73	27.43	GREY	CLAY		
									27.43	29.57	GREY	SILT		
									29.57	31.09	GREY	CLAY		
									31.09	33.53	BROWN	FINE SAND	WATER-BEARING	
6915200	636664.6	4877423	335.774414	33.8328	11.5824	45.4609	Water Supply	Domestic	0.00	5.18	BROWN	SAND		
									5.18	9.45	YELLOW	CLAY		
									9.45	20.73	BROWN	SILT	CLAY	
									20.73	27.74	GREY	CLAY		
									27.74	29.57	GREY	SILT		
									29.57	31.39	GREY	CLAY		
									31.39	33.83	BROWN	FINE SAND	VERY	
6915201	636614.6	4877423	335.848358	34.1376	12.4968	18.18436	Water Supply	Domestic	0.00	4.88	BROWN	SAND		
									4.88	8.84	YELLOW	CLAY		
									8.84	19.81	BROWN	SAND	SILT	CLAY
									19.81	27.43	GREY	CLAY		
									27.43	30.48	GREY	SILT		
									30.48	31.70	GREY	CLAY		
									31.70	34.14	BROWN	SAND		
6915203	636714.6	4877573	336.055572	34.1376	12.8016	36.36872	Water Supply	Domestic	0.00	6.71	BROWN	SAND		
									6.71	9.45	YELLOW	CLAY		
									9.45	21.03	BROWN	SILT	CLAY	
									21.03	32.92	GREY	CLAY		
									32.92	34.14	BROWN	SAND		
6915204	636664.6	4877523	337.079132	35.9664	11.8872	45.4609	Water Supply	Domestic	0.00	7.32	BROWN	SAND		
									7.32	9.75	YELLOW	CLAY	SAND	
									9.75	21.34	BROWN	SILT	CLAY	
									21.34	34.14	GREY	CLAY		
									34.14	35.97	GREY	SAND		
6915207	636814.6	4877473	335.2453	31.3944	11.8872	40.91481	Water Supply	Domestic	0.00	5.49	BROWN	SAND		
									5.49	8.84	YELLOW	CLAY	SAND	
									8.84	20.12	BROWN	SILT	CLAY	
									20.12	29.87	GREY	CLAY		

Appendix C - Summary of MOECC Water Well Records within 500 m
5426, 5452 & 5584 Lakeshore Road, Ballantrae, ON
Town of Whitchurch-Stouffville

Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
									29.87	31.39	BROWN	SAND		
6915208	636814.6	4877423	335.13739	34.1376	12.192	36.36872	Water Supply	Domestic	0.00	6.10	BROWN	SAND		
									6.10	9.14	YELLOW	CLAY	SAND	
									9.14	19.81	BROWN	SILT	CLAY	
									19.81	31.70	GREY	CLAY		
									31.70	34.14	BROWN	SAND		
6915336	636664.6	4877573	336.830963	34.7472	13.1064	45.4609	Water Supply	Domestic	0.00	5.49	BROWN	SAND		
									5.49	9.75	YELLOW	CLAY	SAND	
									9.75	20.73	BROWN	SILT	SAND	CLAY
									20.73	32.92	GREY	CLAY		
									32.92	34.75	BROWN	SAND		
6916128	636664.6	4877423	335.774414	32.6136	12.8016	54.55308	Water Supply	Domestic	0.00	7.92	BROWN	SAND		
									7.92	10.67	YELLOW	CLAY	SAND	
									10.67	20.12	YELLOW	SILT	CLAY	
									20.12	28.65	GREY	CLAY	SILT	
									28.65	31.39	GREY	CLAY		
6916129	636664.6	4877523	337.079132	33.8328	8.2296	22.73045	Water Supply	Domestic	31.39	32.61	BROWN	SAND		
									0.00	6.71	BROWN	SAND		
									6.71	10.36	YELLOW	CLAY	SAND	
									10.36	20.73	YELLOW	SILT	CLAY	
									20.73	24.08	GREY	CLAY		
									24.08	25.60	GREY	SILT		
									25.60	32.92	GREY	CLAY		
6916979	637514.6	4876973	335.299438	12.8016	6.096	68.19135	Water Supply		32.92	33.83	BROWN	SAND		
									0.00	5.49	BROWN	SAND		
									5.49	8.23	BROWN	FINE SAND	CLAY	
6922280	636792	4877588	334.86264	30.48	7.0104	45.4609	Water Supply	Domestic	8.23	12.80	BROWN	SAND		
									0.00	5.18	BROWN	SAND	SILT	
									5.18	7.62	BROWN	CLAY	SOFT	
									7.62	10.06	BROWN	SAND	CLAY	
									10.06	21.34	BROWN	SAND	SILT	
									21.34	27.74	GREY	CLAY	SOFT	
6922367	636590	4876966	335.838867	-	4.8768	4.54609	Water Supply	Domestic	27.74	30.48	GREY	SAND	FINE SAND	
									0.00	3.66	BROWN	SAND	PACKED	
									3.66	4.57	BROWN	GRAVEL	SAND	LOOSE
									4.57	7.01	GREY	CLAY	SOFT	
									7.01	23.47	GREY	SAND	CLAY	SILT
									23.47	29.87	GREY	CLAY	SILT	SOFT
6923350	636724	4877500	336.663696	-	11.2776	45.4609	Water Supply	Domestic	29.87	35.66	GREY	SAND	CLEAN	FINE SAND
6924655	637455.6	4877609	335.470886	-			Water Supply	Domestic	0.00	8.53	BROWN	SAND	CLEAN	
									0.00	11.28	BROWN	SAND	PACKED	

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Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
6924033	637433.6	4877003	333.470880	-	-	-	Water Supply	Domestic	11.28	19.20	BROWN	SAND	WATER-BEARING	CLEAN
7193230	637452	4876994	-	-	-	-	Abandoned-Other		-	-	-	-	-	-
7213031	636794	4877246	-	-	-	-	Abandoned-Other	Not Used	-	-	-	-	-	-
7219787	636675	4877340	-	-	-	-	Abandoned-Other		-	-	-	-	-	-
7219788	636790	4877278	-	-	-	-	Abandoned-Other		-	-	-	-	-	-
7219789	636873	4877365	-	-	-	-	Abandoned-Other		-	-	-	-	-	-
6908106	636489.6	4877072	336.769561	7.31519985	5.7912	22.73	Water Supply	Domestic	0.00	7.32		MEDIUM SAND		
6908111	636457.6	4877323	335.951568	16.7639999	5.4864	13.64	Water Supply	Domestic	0.00	7.62		PREVIOUSLY DUG		
									7.62	8.84		CLAY		
									8.84	10.06		QUICKSAND		
									10.06	10.67		CLAY		
									6.10	16.76		FINE SAND		
6908207	637789.6	4876983	337.210632	8.22959995	6.096	22.73	Water Supply	Domestic	0.00	8.23		MEDIUM SAND		
6908286	637599.6	4876805	333.87973	32.3087997	30.1752	18.18	Water Supply	Livestock / Domestic	0.00	0.61		TOPSOIL		
									0.61	9.75	RED	CLAY		
									9.75	28.96	BLUE	CLAY		
									28.96	30.18		COARSE SAND		
									30.18	32.31		COARSE SAND	GRAVEL	
6908291	638010.6	4877051	336.678649	14.6303997	12.192	18.18	Water Supply	Domestic	0.00	14.63	GREY	MEDIUM SAND		
6908292	638004.6	4877092	338.212463	14.9351997	12.192	22.73	Water Supply	Domestic	0.00	14.94		FINE SAND		
6908295	637691.6	4876805	330.221008	14.6303997	12.192	18.18	Water Supply	Domestic	0.00	14.63		FINE SAND		
6908296	637855.6	4876701	327.324798	9.14400005	6.7056	13.64	Water Supply	Domestic	0.00	1.52		CLAY	STONES	
									1.52	9.14		MEDIUM SAND		
6908298	637748.6	4876849	327.989227	15.2399998	11.2776	22.73	Water Supply	Domestic	0.00	15.24		MEDIUM SAND		
6908312	637765.6	4876633	329.23529	12.1920004	7.62		Water Supply	Domestic	0.00	0.30		TOPSOIL	MEDIUM SAND	
									0.30	3.66		FINE SAND		
									3.66	5.49	BLUE	CLAY		
									5.49	6.71		COARSE SAND		
									6.71	7.62		CLAY		
									7.62	12.19		FINE SAND		
6908315	637723.6	4876933	334.283325	12.49680	9.144	22.73	Water Supply	Domestic	0.00	12.50		MEDIUM SAND		
6908317	637694.6	4876927	334.034606	15.24000	11.5824	13.64	Water Supply	Domestic	0.00	15.24		MEDIUM SAND		
6908323	636534.6	4877435	335.695953	14.32560	10.3632	22.73	Water Supply	Domestic	0.00	10.36		COARSE SAND		
									10.36	14.33		FINE SAND		
6908324	637508.6	4877937	335.000885	13.71600	8.5344	22.73	Water Supply	Domestic	0.00	13.72		MEDIUM SAND	GRAVEL	
6908326	637660.6	4877087	338.204210	17.06880	9.144	113.65	Water Supply	Domestic	0.00	9.14		MEDIUM SAND	STONES	

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Town of Whitchurch-Stouffville

Well ID	Coordinates		Elevation (m)	Depth (m)	Water Level (m)	Water Yield (Lpm)	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y							(m)	(m)				
6908328	636664.6	4877771	334.816101	14.6303997	10.668	18.18	Water Supply	Domestic	9.14	17.07		COARSE SAND	GRAVEL	
6908328	636664.6	4877771	334.816101	14.6303997	10.668	18.18	Water Supply	Domestic	0.00	5.18		MEDIUM SAND		
									5.18	9.14		CLAY		
									9.14	14.63		MEDIUM SAND		
6908329	636487.6	4877613	337.510192	4.87680006	1.8288	4.55	Water Supply	Domestic	0.00	1.83		MEDIUM SAND		
									1.83	4.88		QUICKSAND		
6908332	637485.6	4878026	334.995513	14.3256006	8.5344	31.82	Water Supply	Irrigation	0.00	11.28		COARSE SAND		
									11.28	14.33		FINE SAND		
6908334	637388.6	4878088	331.921722	17.6784	7.62	136.38	Water Supply	Irrigation	0.00	0.30		TOPSOIL		
									0.30	6.10	BROWN	TOPSOIL	MEDIUM SAND	
									6.10	17.07		MEDIUM SAND		
									17.07	17.68		COARSE SAND		
6908336	636502.6	4877563	337.152191	10.9728003	4.2672	18.18	Water Supply	Domestic	0.00	3.66		PREVIOUSLY DUG		
									3.66	9.75		MEDIUM SAND	CLAY	
									9.75	10.97		FINE SAND		
6908337	636534.6	4877569	336.969573	11.2776003	9.144	18.18	Water Supply	Commercial	0.00	6.10		FINE SAND		
									6.10	9.14	BLUE	CLAY		
									9.14	11.28		FINE SAND		

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Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
6910881	636464.6	4877673	337.795654	23.7744007			Abandoned-Supply		0.00	1.52	BROWN	SAND		
									1.52	5.49	BROWN	CLAY	SAND	SILT
									5.49	7.01	BLUE	SAND	CLAY	
									7.01	15.24	BROWN	CLAY	SAND	
									15.24	23.77	BLUE	CLAY	SAND	SILT
6911229	637964.6	4877253	341.362243	21.6408005	19.812	27.28	Water Supply	Domestic	0.00	21.64		SAND		
6911230	638014.6	4877223	340.495971	19.8120003	18.288	22.73	Water Supply	Domestic	0.00	1.52		CLAY		
									1.52	19.81		SAND		
6911732	637889.6	4877273	342.324432	21.3360004	18.288	22.73	Water Supply	Domestic	0.00	1.52		CLAY		
									1.52	21.34		SAND		
6911733	637974.6	4877323	341.662109	21.3360004	18.288	22.73	Water Supply	Domestic	0.00	1.52		CLAY		
									1.52	21.34		SAND		
6911734	637914.6	4877228	341.582031	21.3360004	18.288	22.73	Water Supply	Domestic	0.00	1.52		CLAY		
									1.52	21.34		SAND		
6911823	638019.6	4877048	336.455413	14.3256006	10.0584	18.18	Water Supply	Domestic	0.00	2.44	BROWN	CLAY	SAND	
									2.44	6.10	BROWN	SAND		
									6.10	10.06	BROWN	FINE SAND	CLAY	
									10.06	14.33	BROWN	FINE SAND		
6912068	638004.6	4877200	339.9971	19.5072002	14.6304	18.18	Water Supply	Public	0.00	1.52	BROWN	SAND	CLAY	STONES
									1.52	14.02	BROWN	SAND		
									14.02	19.51	BROWN	SAND		
6912165	638010.6	4877150	339.902191	21.9456005	17.0688	22.73	Water Supply	Public	0.00	1.22	BROWN	CLAY		
									1.22	17.07	BROWN	SAND	CLAY	
									17.07	21.95	BROWN	SAND		
6912662	637492.6	4877924	335.055114	21.3360004	10.9728	45.46	Water Supply	Domestic	0.00	5.18	GREY	SAND		
									5.18	10.97	GREY	SAND	CLAY	
									10.97	21.34		FINE SAND		
6912839	636424.6	4877244	336.987548	17.9832001	7.3152	27.28	Water Supply	Domestic	0.00	1.22		PREVIOUSLY DUG		
									1.22	5.49	BROWN	SAND		
									5.49	10.06	YELLOW	CLAY	SAND	
									10.06	15.85	BROWN	SILT	SAND	CLAY
									15.85	17.98	BROWN	FINE SAND		
6912862	636454.6	4877019	335.906829	38.1000023	10.9728	50.01	Water Supply	Domestic	0.00	1.22	BROWN	SAND	GRAVEL	
									1.22	3.66	BROWN	SAND		
									3.66	10.06	YELLOW	CLAY		
									10.06	20.73	GREY	SILT	CLAY	
									20.73	33.53	GREY	CLAY		
									33.53	38.10	GREY	FINE SAND		
6913618	636464.6	4877173	337.557678	35.052002	12.192	45.46	Water Supply	Commerical	0.00	7.62	BROWN	SAND		
									7.62	12.19	BROWN	CLAY		
									12.19	33.53	BLUE	CLAY	SOFT	

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Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
									33.53	35.05	BLUE	FINE SAND		
6913738	637714.6	4876723	325.282379	15.2399998		22.73	Abandoned-Supply		0.00	10.67		SAND	DRY	
									10.67	15.24		SAND		

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Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
6914058	636414.6	4877573	337.550292	27.4320011	9.144	9.09	Water Supply	Domestic	0.00	3.66	BROWN	SAND	LOOSE	
									3.66	10.06	BROWN	SAND	CLAY	
									10.06	20.12	BROWN	SAND	LOOSE	
									20.12	21.03	BLUE	CLAY	DENSE	
									21.03	23.77	BLUE	CLAY	SANDY	SOFT
									23.77	27.43	BLUE-GREY	QUICKSAND	SILT	SOFT
6915206	636464.6	4877573	337.476959	34.7472	10.9728	68.19	Water Supply	Domestic	0.00	6.40	BROWN	SAND		
									6.40	9.14	YELLOW	CLAY	SAND	
									9.14	20.73	BROWN	SILT	CLAY	
									20.73	32.92	GREY	CLAY	SILT	
									32.92	34.75	BROWN	SAND		
6916040	637314.6	4877873	332.090789	13.7160006	4.8768	68.19	Water Supply	Domestic	0.00	0.30	BROWN	TOPSOIL		
									0.30	4.88	BROWN	SAND	CLAY	
									4.88	11.28	BROWN	SAND		
									11.28	13.72	BLUE	FINE SAND		
6916111	637864.6	4877073	339.267395	17.0688		22.73	Water Supply	Domestic	0.00	3.05	BROWN	CLAY	SANDY	
									3.05	15.54	BROWN	COARSE SAND		
									15.54	17.07	BROWN	MEDIUM SAND		
6916112	637814.6	4877073	340.229309	18.8976002	12.8016	18.18	Water Supply	Domestic	0.00	2.74	BROWN	CLAY	SANDY	
									2.74	16.15	BROWN	MEDIUM SAND		
									16.15	18.90	BROWN	FINE SAND		
6916113	637764.6	4876973	336.926513	34.4424019	13.4112	18.18	Water Supply	Domestic	0.00	5.49	BROWN	CLAY	SANDY	
									5.49	20.42	BROWN	SAND	CLAY	LAYERED
									20.42	29.57	GREY	CLAY	SILTY	
									29.57	32.00	GREY	CLAY	STONES	
									32.00	33.53	GREY	FINE SAND	SILTY	
									33.53	34.44	GREY	FINE SAND		
6916668	637814.6	4877073	340.229309	18.2880001		22.73	Water Supply	Domestic	0.00	2.13		CLAY		
									2.13	13.72		SAND	CLAY	
									13.72	18.29		FINE SAND		
6916753	636464.6	4877323	336.057067	16.1543999	5.4864	13.64	Water Supply	Domestic	0.00	1.83		PREVIOUSLY DUG		
									1.83	9.14	BROWN	SAND	DRY	
									9.14	12.19	BROWN	SAND	CLAY	
									12.19	13.72	GREY	CLAY	LOOSE	
									13.72	15.54	GREY	SAND	CLAY	LIGHT-COLOURED
									15.54	16.15	BROWN	SAND		
6916754	638014.6	4877123	339.487274	17.6784	10.9728	18.18	Water Supply	Domestic	0.00	9.14	BROWN	SAND	DRY	
									9.14	14.63	BROWN	SAND		
									14.63	17.68	BROWN	SAND	CLAY	LOOSE
6917055	638014.6	4877023	335.910461	17.0688	12.192	27.28	Water Supply	Domestic	0.00	3.66	BROWN	CLAY	SANDY	
									3.66	17.07	BROWN	SAND		

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	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
6917739	637784.6	4876699	331.481506	12.1920004	6.7056	22.73	Water Supply		0.00	0.61	BLACK	TOPSOIL		
									0.61	6.71		FINE SAND	FINE SAND	
									6.71	12.19	BROWN	SAND		
6917903	637599.6	4876805	333.87973	20.7264004	10.668	45.46	Water Supply	Domestic	0.00	5.18	BROWN	SAND	CLAY	
									5.18	15.85	BROWN	SAND		
									15.85	16.76	BROWN	SAND	CLAY	
									16.76	20.73	BROWN	SAND		
6917906	636947	4877772	332.503387	24.9936008	6.096	31.82	Water Supply	Domestic	0.00	13.72	BROWN	SAND	CLAY	
									13.72	21.03	BLUE	CLAY	SOFT	
									21.03	22.86	BLUE	CLAY	SAND	FINE SAND
									22.86	24.99	BLUE	SAND		
6917907	636947	4877772	332.503387	33.2232018	6.7056	27.28	Water Supply	Domestic	0.00	14.33	BROWN	SAND	CLAY	
									14.33	26.82	BLUE	CLAY	SOFT	
									26.82	28.65	BLUE	CLAY	SAND	
									28.65	30.48	BLUE	CLAY		
									30.48	33.22	BLUE	SAND	FINE SAND	
6918902	637599.6	4876805	333.87973	16.1543999	7.62	27.28	Water Supply	Domestic	0.00	5.49	BROWN	SAND	CLAY	
									5.49	16.15	BROWN	SAND		
6918978	637793	4876710	331.233337	34.7472	4.572	54.55	Water Supply	Domestic	0.00	5.79	BROWN	SAND	SILT	SOFT
									5.79	7.01	BROWN	SAND	CLAY	
									7.01	12.19	BROWN	GRAVEL	HARD	
									12.19	24.69	BLUE	CLAY	SOFT	
									24.69	33.53	BROWN	SAND	COARSE SAND	
									33.53	34.75	BLUE	CLAY		
6918990	637793	4876710	331.233337	21.6408005	6.096	54.55	Water Supply	Domestic	0.00	0.30		TOPSOIL		
									0.30	6.40	BROWN	SAND	CLAY	SOFT
									6.40	18.90	BLUE	CLAY		
									18.90	21.64				
6919467	636440.6	4877323	335.658935	17.6784	7.9248	27.28	Water Supply	Domestic	0.00	4.88	BROWN	SAND		
									4.88	7.62	YELLOW	CLAY		
									7.62	14.02	BROWN	SAND		
									14.02	14.63	GREY	CLAY		
									14.63	15.54	GREY	SILT		
									15.54	17.68	BROWN	SAND		
6908112	636405.6	4877456	335.174194	17.6784	9.144	22.73	Water Supply	Livestock / Domestic	0.00	7.32		PREV. DRILLED		
									7.32	8.53	BLUE	CLAY		
									8.53	17.68		FINE SAND		
6908325	637382.6	4877839	334.059265	13.7160006	8.5344	22.73	Water Supply	Domestic	0.00	13.72		MEDIUM SAND	GRAVEL	
6908333	637668.6	4877985	338.195068	19.2024002	10.3632	63.65	Water Supply	Domestic	0.00	10.36		MEDIUM SAND		
									10.36	19.20		FINE SAND		

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	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
6914559	636664.6	4877623	335.564971	29.8703995	12.4968	27.28	Water Supply	Domestic	0.00	4.57	BROWN	SAND		
									4.57	9.75	YELLOW	CLAY		
									9.75	20.73	GREY	SILT	CLAY	
									20.73	23.77	GREY	CLAY		
									23.77	24.99	GREY	SILT		
									24.99	27.74	GREY	CLAY		
									27.74	29.87	GREY	FINE SAND		
6914560	636564.6	4877573	336.838867	29.8703995	12.192	22.73	Water Supply	Domestic	0.00	3.96	BROWN	SAND		
									3.96	9.14	YELLOW	CLAY		
									9.14	20.73	GREY	SILT	CLAY	
									20.73	22.86	GREY	CLAY		
									22.86	24.69	GREY	SILT		
									24.69	28.04	GREY	CLAY		
									28.04	29.87	GREY	FINE SAND		
6914901	638014.6	4877073	337.439208	15.2399998			Observation Wells	Not Used	0.00	2.74	BROWN	SAND	SILT	LOOSE
									2.74	3.96	BROWN	SILT	CLAY	SANDY
									3.96	15.24	BROWN	FINE SAND	MEDIUM SAND	PACKED
6916114	637814.6	4876973	335.489288	15.2399998	8.8392	27.28	Water Supply	Domestic	0.00	0.61	BROWN	CLAY		
									0.61	5.18	BROWN	CLAY	SANDY	
									5.18	11.89	BROWN	MEDIUM SAND	CLAY	LAYERED
									11.89	15.24	BROWN	FINE SAND		
6916115	637714.6	4876973	335.721893	20.7264004	11.8872	18.18	Water Supply	Domestic	0.00	3.66	BROWN	CLAY	SANDY	
									3.66	12.50	BROWN	MEDIUM SAND		
									12.50	18.90	BROWN	FINE SAND		
									18.90	20.73	GREY	FINE SAND		
6916311	637814.6	4877023	339.16571	21.3360004	11.8872	22.73	Water Supply	Domestic	0.00	8.84	BROWN	CLAY	SANDY	
									8.84	18.29	BROWN	SAND	CLAY	LAYERED
									18.29	21.34	BROWN	SAND		
6916313	637714.6	4877023	337.695434	17.3736	7.62	45.46	Water Supply	Domestic	0.00	0.30	BLACK	TOPSOIL		
									0.30	4.57	BROWN	CLAY		
									4.57	9.75	BROWN	COARSE SAND		
									9.75	13.72	BROWN	SAND	CLAY	
									13.72	17.37	BROWN	SAND		
6916314	637864.6	4876973	331.148803	30.4799995	10.668	27.28	Water Supply	Domestic	0.00	0.61	BROWN	TOPSOIL	SANDY	
									0.61	15.54	BROWN	SAND		
									15.54	16.76	BROWN	CLAY	SANDY	
									16.76	28.65	BLUE	CLAY	SANDY	
									28.65	30.48	BLUE	SAND		

Appendix C - Summary of MOECC Water Well Records within 500 m
5426, 5452 & 5584 Lakeshore Road, Ballantrae, ON
Town of Whitchurch-Stouffville

Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
6916349	636514.6	4877523	336.760253	35.3568001	5.4864	45.46	Water Supply	Domestic	0.00	6.40	YELLOW	SAND	CLAY	
									6.40	17.68	GREY	SAND	CLAY	SOFT
									17.68	27.43	YELLOW	CLAY	SOFT	
									27.43	32.61	GREY	TILL		
									32.61	35.36	GREY	FINE SAND	CLEAN	
6917363	636414.6	4877423	334.993621	17.3736	5.4864	13.64	Water Supply	Domestic	0.00	10.36	BROWN	SAND	DRY	
									10.36	14.02	BROWN	SAND	CLAY	
									14.02	17.37	BROWN	FINE SAND	WATER-BEARING	
6917705	636523	4877495	336.426635	124.968002	35.052	77.28	Water Supply	Domestic / Municipal	0.00	0.61		TOPSOIL		
									0.61	8.23	BROWN	FINE SAND		
									8.23	34.75	BROWN	FINE SAND	CLAY	
									34.75	117.04	GREY	SAND	CLAY	DENSE
									117.04	118.87		MEDIUM SAND	COARSE SAND	
									118.87	122.22		CLAY		
									122.22	122.83		MEDIUM SAND	COARSE SAND	
									122.83	124.97		CLAY	TILL	
6918298	637628.6	4876894	334.848236	13.1064005	7.62	22.73	Water Supply	Public	0.00	7.62	BROWN	SAND		
									7.62	13.11	BROWN	SAND		
6920075	637295	4877793	332.955627	145.694397			Test Hole	Not Used	0.00	8.53		SAND		
									8.53	14.63	BROWN	CLAY	SOFT	
									14.63	25.91		FINE SAND	COARSE SAND	
									25.91	51.21	GREY	CLAY		
									51.21	59.13		CLAY	GRAVEL	HARD
									59.13	116.74		GRAVEL	CLAY	HARD
									116.74	124.36		GRAVEL	CLAY	
									124.36	131.67		CLAY	GRAVEL	
									131.67	134.42		GRAVEL	CLAY	
									134.42	141.43		CLAY	GRAVEL	HARD
									141.43	145.69		SHALE		
6921306	637686	4876817	331.052368	22.5552006	13.1064	22.73	Water Supply		0.00	14.63		UNKNOWN TYPE		
									14.63	22.56	BROWN	FINE SAND		

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5426, 5452 & 5584 Lakeshore Road, Ballantrae, ON
Town of Whitchurch-Stouffville

Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
6922603	637225	4877785	331.542114	76.2000046	13.716	45.46	Water Supply	Domestic	0.00	4.57	BROWN	SAND	SILT	LOOSE
									4.57	6.10	BROWN	SILT	CLAY	SOFT
									6.10	16.76	BROWN	SAND	SILT	LOOSE
									16.76	18.29	GREY	CLAY	SILT	SOFT
									18.29	22.86	GREY	SILT	SAND	SOFT
									22.86	24.99	GREY	CLAY	SILT	SOFT
									24.99	44.20	GREY	SILT	SAND	SOFT
									44.20	51.82	BROWN	FINE SAND	SILT	LOOSE
									51.82	54.86	GREY	SILT	CLAY	SOFT
									54.86	59.44	GREY	SILT	SAND	CLAY
									59.44	64.01	BROWN	GRAVEL	SAND	SILT
									64.01	68.58	GREY	SILT	GRAVEL	SAND
									68.58	76.20	GREY	CLAY	SILT	
6922821	637279	4877839	331.796813	61.5695992	10.3632	22.73	Water Supply	Domestic	0.00	9.14	BROWN	FINE SAND	SILT	
									9.14	13.72	BROWN	SILT	CLAY	FINE SAND
									13.72	42.67	BROWN	SILT	FINE SAND	
									42.67	45.72	BROWN	SILT	FINE SAND	CLAY
									45.72	48.77	GREY	CLAY	SILT	SOFT
									48.77	54.86	GREY	CLAY	SILT	
									54.86	56.39	BROWN	GRAVEL	SILT	LOOSE
									56.39	59.44	GREY	SILT	CLAY	GRAVEL
									59.44	61.57	GREY	SILT	CLAY	SAND
6922822	637307	4877935	331.628784	9.14400005			Observation Wells		0.00	0.30	BLACK	TOPSOIL		
									0.30	1.83	BROWN	SILT	SAND	CLAY
									1.83	9.14	BROWN	SILT	FINE SAND	
6922823	637225	4877785	331.542114	65.5319977	16.4592	54.55	Water Supply	Domestic	0.00	4.57	BROWN	SAND	SILT	
									4.57	6.10	BROWN	CLAY	SILT	
									6.10	16.76	BROWN	SAND	SILT	
									16.76	18.90	GREY	CLAY	SILT	LAYERED
									18.90	25.91	GREY	SILT	SAND	CLAY
									25.91	51.82	GREY	SILT	SAND	
									51.82	54.86	GREY	SILT	CLAY	
									54.86	59.44	GREY	SILT	SAND	CLAY
									59.44	61.57	GREY	SILT	GRAVEL	
									61.57	64.01	GREY	SAND	GRAVEL	SILT
									64.01	65.53	GREY	CLAY	SILT	SAND
6922824	637279	4877783	332.824249	9.14400005			Observation Wells	Not Used	0.00	0.30	BLACK	TOPSOIL		
									0.30	1.83	BROWN	SILT	SAND	CLAY
									1.83	9.14	BROWN	SILT	FINE SAND	

Appendix C - Summary of MOECC Water Well Records within 500 m
5426, 5452 & 5584 Lakeshore Road, Ballantrae, ON
Town of Whitchurch-Stouffville

Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
6922825	637279	4877839	331.796813	82.2959976	35.9664	54.55	Water Supply	Domestic	0.00	0.30	BLACK	TOPSOIL		
									0.30	1.83	BROWN	SILT	SAND	CLAY
									1.83	10.67	BROWN	SILT	FINE SAND	
									10.67	16.76	GREY	CLAY	SILT	LAYERED
									16.76	51.82	GREY	SILT	FINE SAND	CLAY
									51.82	57.91	GREY	CLAY	SILT	SANDSTONE
									57.91	60.96	GREY	SILT	GRAVEL	DRY
									60.96	70.10	GREY	CLAY	GRAVEL	SILT
									70.10	71.63	GREY	CLAY	DENSE	
									71.63	76.20	GREY	SILT	SAND	CEMENTED
									76.20	79.25	GREY	CLAY	DENSE	
									79.25	80.47	BLACK	GRAVEL	SAND	SILT
									80.47	82.30	GREY	SILT	SAND	CLAY
6922826	637307	4877935	331.628784	9.14400005			Observation Wells	Not Used	0.00	0.30	BLACK	TOPSOIL		
									0.30	1.83	BROWN	SILT	SAND	CLAY
									1.83	9.14	BROWN	SILT	FINE SAND	
6923838	637406	4877879	335.008636	23.1648006	6.7056	477.34	Test Hole	Irrigation	0.00	0.61	BROWN	CLAY	SAND	
									0.61	9.14	BROWN	SAND	MEDIUM-GRAINED	
									9.14	10.67	BROWN	FINE SAND		
									10.67	19.81	BROWN	COARSE SAND		
									19.81	23.16	GREY	SAND	SILT	LAYERED
6923839	637349	4878067	331.726623	42.6720009	8.8392	363.69	Test Hole	Irrigation	0.00	0.61	BROWN	TOPSOIL	SANDY	
									0.61	4.27	BROWN	SAND		
									4.27	4.57		GRAVEL	MEDIUM-GRAINED	
									4.57	6.10	BROWN	SAND	GRAVEL	COARSE-GRAINED
									6.10	20.42	BROWN	SAND		
									20.42	22.86	GREY	SAND		
									22.86	42.67	GREY	CLAY	SILT	LAYERED
6923840	637350	4877970	332.455413	42.6720009			Observation Wells	Not Used	0.00	0.30	BROWN	TOPSOIL		
									0.30	2.44	BROWN	CLAY	SILT	
									2.44	3.05	BROWN	SAND		
									3.05	7.92	BROWN	CLAY	SILT	
									7.92	19.51	BROWN	CLAY	SAND	LAYERED
									19.51	40.84	GREY	CLAY	SILT	
									40.84	42.67	GREY	CLAY	STICKY	

Appendix C - Summary of MOECC Water Well Records within 500 m
 5426, 5452 & 5584 Lakeshore Road, Ballantrae, ON
 Town of Whitchurch-Stouffville

Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
6923841	637350	4877970	332.455413	42.6720009			Test Hole	Not Used	0.00	0.61		TOPSOIL		
									0.61	3.05	BROWN	CLAY	SANDY	
									3.05	9.45	BROWN	CLAY	SILT	
									9.45	11.89	BROWN	CLAY	SAND	GRAVEL
									11.89	30.48	BROWN	CLAY	SAND	LAYERED
									30.48	37.80	GREY	CLAY	SANDSTONE	LAYERED
									37.80	42.67	GREY	CLAY	SOFT	
6924057	637999	4876951	332.294342				Abandoned-Other	Not Used						
6924192	637917	4876947	327.488281											
6924196	637908	4876982	329.9776				Abandoned-Other	Domestic						
6924197	637969	4876956	330.98236				Abandoned-Supply							
6924337	637666	4876962	335.350891				Abandoned-Other							
6924352	637667	4877005	336.244689				Abandoned-Other							
6924418	637698	4877030	337.475158				Abandoned-Other							
6924421	636438	4877418	335.106567				Abandoned-Other							
6924422	636438	4877418	335.106567				Abandoned-Other							
6924477	636411	4877564	337.39328				Abandoned-Other							
6924590	637643	4876866	333.485839				Abandoned-Other							
6924593	637436	4877810	334.952911				Abandoned-Other							
6924606	637643	4876866	333.485839				Abandoned-Other							
6924724	636524	4877082	337.042053				Abandoned-Other							
6924824	637349	4878067	331.726623	23.1648006	8.8392	500.07	Water Supply	Domestic	0.00	0.61	BROWN	TOPSOIL		
									0.61	4.27	BROWN	SAND		
									4.27	4.57		GRAVEL		
									4.57	6.10	BROWN	SAND	GRAVEL	
									6.10	21.03	BROWN	SAND		
									21.03	22.86	GREY	SAND		
									22.86	23.16	GREY	CLAY	SILTY	SAND

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5426, 5452 & 5584 Lakeshore Road, Ballantrae, ON
Town of Whitchurch-Stouffville

Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
6924825	637377.1	4878021	332.6315	24.6888008		0.00	Water Supply	Domestic	0.00	0.30	BROWN	TOPSOIL		
									0.30	4.88	BROWN	SAND		
									4.88	15.85	BROWN	CLAY		
									15.85	24.08	BROWN	SAND	GRAVEL	MEDIUM GRAVEL
									24.08	24.69	GREY	CLAY		
6924826	637406	4877879	335.008636	21.9456005	1.8288	500.07	Water Supply	Livestock	0.00	0.30	BROWN	TOPSOIL		
									0.30	17.68	BROWN	SAND	SILTY	
									17.68	18.29	BROWN	SAND		
									18.29	19.20	BROWN	SAND	GRAVEL	
									19.20	21.34	BROWN	SAND		
6924827	637377.1	4878021	332.6315	22.8600006			Water Supply	Not Used	21.34	21.95	GREY	SAND	SILT	
									0.00	0.30	BROWN	TOPSOIL		
									0.30	6.10	BROWN	SAND	FINE SAND	
									6.10	12.19	BROWN	SAND	COARSE SAND	
									12.19	14.02		GRAVEL	FINE SAND	
6924828	637377.1	4878021	332.6315	24.3840008			Water Supply	Not Used	14.02	18.29	GREY	SAND	MEDIUM SAND	COARSE GRAVEL
									18.29	22.86	GREY	SAND	MEDIUM SAND	
									0.00	5.49	BROWN	CLAY		
									5.49	7.92	BROWN	CLAY	SAND	
									7.92	23.77	BROWN	SAND		
6924829	637377.1	4878021	332.6315	21.3360004			Observation Wells	Not Used	23.77	24.38	BROWN	SAND	CLAY	
									0.00	3.96	BROWN	CLAY	SANDY	
									3.96	7.01	BROWN	SAND	SILTY	DIRTY
									7.01	14.94	BROWN	CLAY	SANDY	
									14.94	16.15	GREY	CLAY	SOFT	
6924830	637377.1	4878021	332.6315	23.4696007			Observation Wells	Not Used	16.15	18.59	BROWN	CLAY		
									18.59	20.12	BROWN	SAND	SILTY	
									20.12	21.34	BROWN	CLAY	CLAY	SILTY
									0.00	5.18	BROWN	CLAY	STONES	
									5.18	6.10	BROWN	SAND		
6924831	637377.1	4878021	332.6315	23.7744007			Water Supply	Not Used	6.10	11.58	BROWN	CLAY	STONES	
									11.58	20.42	BROWN	SAND	CLAY	STONES
									20.42	22.86	BROWN	SAND	FINE SAND	
									22.86	23.47	BROWN	CLAY		
									0.00	3.05	BROWN	SAND		
									3.05	3.66	BROWN	SAND	GRAVEL	
									3.66	22.86	BROWN	SAND	MEDIUM SAND	
									22.86	23.16	BROWN	SAND	FINE SAND	
									23.16	23.77	GREY	SAND	CLAY	

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5426, 5452 & 5584 Lakeshore Road, Ballantrae, ON
Town of Whitchurch-Stouffville

Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
6924832	637377.1	4878021	332.6315	25.9080009			Water Supply	Not Used	0.00	0.30	BROWN	SAND	TOPSOIL	
									0.30	5.18	BROWN	SAND	MEDIUM SAND	
									5.18	17.07	BROWN	SAND	GRAVEL	
									17.07	25.60	BROWN	SAND	FINE SAND	MEDIUM SAND
									25.60	25.91	BROWN	SAND	CLAY	
6924833	637377.1	4878021	332.6315	23.7744007			Observation Wells	Not Used	0.00	0.30	BROWN	TOPSOIL		
									0.30	1.22	BROWN	CLAY		
									1.22	3.35	GREY	CLAY		
									3.35	7.32	BROWN	CLAY	SAND	
									7.32	8.23	BROWN	CLAY		
									8.23	22.25	BROWN	SAND	FINE SAND	MEDIUM SAND
									22.25	23.77	BROWN	CLAY	SAND	
6924834	637377.1	4878021	332.6315	24.0792007			Water Supply	Not Used	0.00	0.30	BROWN	SAND	TOPSOIL	
									0.30	16.15	BROWN	SAND	FINE SAND	
									16.15	21.95	BROWN	SAND	MEDIUM SAND	
									21.95	22.25	GREY	CLAY	STONES	
									22.25	23.77	GREY	SAND		
									23.77	24.08	GREY	CLAY		
6924835	637377.1	4878021	332.6315	22.8600006		9.09218	Observation Wells	Not Used	0.00	6.71	BROWN	SAND	SILT	
									6.71	8.84	BROWN	SILT	SAND	FINE SAND
									8.84	22.86	BROWN	SAND	SILT	FINE SAND
6924836	637377.1	4878021	332.6315	24.0792007		9.09218	Observation Wells	Not Used	0.00	5.79	BROWN	SAND	SILT	FINE SAND
									5.79	14.63	BROWN	SAND	GRAVEL	SAND
									14.63	17.07	BROWN	SAND	GRAVEL	CLAY
									17.07	18.59	BROWN	CLAY		
									18.59	20.12	BROWN	SAND	GRAVEL	
									20.12	24.08	BROWN	SAND	SILT	
6926030	637597.1	4876805	333.946472				Abandoned-Other							
6930047	636472	4876987	336.05014	8.52999973			Observation Wells	Not Used	0.00	8.53	BROWN	SAND	SILTY	
6930078	636442	4877043	335.819274	6.09999999			Observation Wells	Not Used	0.00	0.20	BLACK	TOPSOIL		
									0.20	6.10	BROWN	SAND	SILTY	
6930461	636471	4876986	336.029174	6.30000019			Observation Wells		0.00	0.60	BROWN	GRAVEL		
									0.60	3.60	BROWN	SAND	SILT	
									3.60	6.00	BROWN	SAND	SILT	WATER-BEARING
									6.00	6.30	BROWN	SILT	CLAY	
6930462	636471	4876986	336.029174				Abandoned-Other							
6930721	636488	4877032	336.44223	4.5			Observation Wells		0.00	3.00	BROWN	FILL	SAND	
									3.00	4.50	BROWN	FILL	SAND	

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5426, 5452 & 5584 Lakeshore Road, Ballantrae, ON
Town of Whitchurch-Stouffville

Well ID	Coordinates		Elevation	Depth	Water Level	Water Yield	Water Use	Water Status	Top	Bottom	Colour	Material 1	Material 2	Material 3
	X	Y	(m)	(m)	(m)	(Lpm)			(m)	(m)				
7052108	637787	4876645	330.590728				Abandoned-Other							
7193230	637452	4876994					Abandoned-Other							
7228778	636497	4877481												
7240908	636440	4877388		4.57200003			Test Hole	Test Hole / Monitoring	0.00	3.66	BROWN	SAND	GRAVEL	
									3.66	4.57	BROWN	FINE SAND		
7240909	636406	4877363		3.0480001				Test Hole / Monitoring	0.00	1.52	BROWN	SAND	TOPSOIL	
									1.52	3.05	BROWN	FINE SAND	WATER-BEARING	
7240910	636396	4877423		3.0480001				Test Hole / Monitoring	0.00	1.52	BROWN	SAND	TOPSOIL	
									1.52	3.05	BROWN	FINE SAND	WATER-BEARING	
7240911	636419	4877457		6.09600019			Test Hole	Test Hole / Monitoring	0.00	3.96	BROWN	FINE SAND		
									3.96	6.10	BROWN	FINE SAND	WATER-BEARING	
7240912	636405	4877444		6.09600019			Observation Wells	Test Hole / Monitoring	0.00	3.96	BROWN	FINE SAND		
									3.96	6.10	BROWN	FINE SAND	WATER-BEARING	
7240913	636393	4877457		6.09600019			Replacement Well	Test Hole / Monitoring	0.00	3.96	BROWN	FINE SAND		
									3.96	6.10	BROWN	FINE SAND	WATER-BEARING	
7245058	636437	4877412					Abandoned-Other	Test Hole / Monitoring						
7248168	636392	4877478					Abandoned-Other							

APPENDIX

C BOREHOLE AND TEST PIT LOGS

PROJECT: Hydrogeological Investigation

CLIENT: Far Sight Homes

PROJECT LOCATION: 5426 - 5584 Lakeshore Road, Ballantrae, Ontario

DATUM: Geodetic

BH LOCATION:

DRILLING DATA

Method: Geoprobe 782DT

Diameter: 127 mm

Date: May/30/2016

REF. NO.: 161-06960-00

ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (g/cm ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)				W _p	W	W _L			
0.0	Ground Surface							20 40 60 80 100	20 40 60 80 100			10 20 30					GR SA SI CL
0.4	TOPSOIL: 360 mm, sandy topsoil, trace silt, trace organics, black, moist to wet, soft SAND: Medium to fine sand, trace silt, red to orange changing to brown to grey with depth, wet to saturated, soft, compact		1	GRAB													
1.5	SAND: Medium to fine sand, trace silt, grey, wet to saturated, soft, compact/dense		2	GRAB													0 87 10 3
3.0																	
4.0			3	GRAB													
5.0																	
6.0	Sand becoming fine below 5.5 m		4	GRAB													
6.1	END OF BOREHOLE Notes: 1) 50 mm diam. monitoring well installed upon completion, screened 3.05 to 6.1 mbgs 2) MW stick up = 0.87 m 3) Water Level Record: Date 30/05/2016 Depth (mbgs) 0.65																

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

PROJECT: Hydrogeological Investigation

CLIENT: Far Sight Homes

PROJECT LOCATION: 5426 - 5584 Lakeshore Road, Ballantrae, Ontario

DATUM: Geodetic

BH LOCATION:

DRILLING DATA

Method: Geoprobe 782DT

Diameter: 127 mm

Date: May/30/2016

REF. NO.: 161-06960-00

ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC NATURAL LIQUID			POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)				W _p	W	W _L			
0.0	Ground Surface							20	40	60	80	100					GR SA SI CL
0.2	TOPSOIL: 230 mm, sandy topsoil, trace silt, some rootlets and organics, dark brown, dry to damp, loose		1														
	SAND: Medium to fine sand, some silt, trace gravel, light brown, damp, soft																
2.0	SAND: Medium to fine sand, trace silt, grey, wet to saturated, soft		2														0 68 29 3
			3														
			4														
6.1	END OF BOREHOLE Notes: 1) 50 mm diam. monitoring well installed upon completion, screened 3.05 to 6.1 mbgs 2) MW stick up = 0.84 m 3) Water Level Record: Date 30/05/2016 Depth (mbgs) 3.0																

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

PROJECT: Hydrogeological Investigation

CLIENT: Far Sight Homes

PROJECT LOCATION: 5426 - 5584 Lakeshore Road, Ballantrae, Ontario

DATUM: Geodetic

BH LOCATION:

DRILLING DATA

Method: Geoprobe 782DT

Diameter: 127 mm

Date: May/31/2016

REF. NO.: 161-06960-00

ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)						
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L			
								20 40 60 80 100										
								20 40 60 80 100										

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, x 3: Numbers refer to Sensitivity

○ s=3% Strain at Failure

PROJECT: Hydrogeological Investigation

CLIENT: Far Sight Homes

PROJECT LOCATION: 5426 - 5584 Lakeshore Road, Ballantrae, Ontario

DATUM: Geodetic

BH LOCATION:

DRILLING DATA

Method: Geoprobe 782DT

Diameter: 127 mm

Date: May/30/2016

REF. NO.: 161-06960-00

ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)											WATER CONTENT (%)		
								20	40	60	80	100							20	40	60
0.0	Ground Surface																				
	SAND: Medium to fine sand, trace silt, top 2.5 cm black, bottom light brown to grey, moist, soft		1																		
1.5	SAND: Becoming coarser, grey, moist becoming wet below 2.8 m, soft, compact		2																		
3.0	SAND and SILT: Medium sand, grey, wet to saturated, compact		3																		
			4																		
6.1	END OF BOREHOLE Notes: 1) 50 mm diam. monitoring well installed upon completion, screened 3.05 to 6.1 mbgs 2) MW stick up = 0.85 m 3) Water Level Record: <u>Date</u> <u>Depth (mbgs)</u> 30/05/2016 2.88																				

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

PROJECT: Hydrogeological Investigation

CLIENT: Far Sight Homes

PROJECT LOCATION: 5426 - 5584 Lakeshore Road, Ballantrae, Ontario

DATUM: Geodetic

BH LOCATION:

DRILLING DATA

Method: Geoprobe 782DT

Diameter: 127 mm

Date: May/31/2016

REF. NO.: 161-06960-00

ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)				W _p	W	W _L			
0.0	Ground Surface							20	40	60	80	100					
0.2	TOPSOIL: 229 mm, sandy topsoil, some roots and organics, dark brown, dry to damp, loose		1					20	40	60	80	100					
	SAND: Medium to fine sand, trace silt, light brown, damp, soft																
3.0	SAND: Trace silt, light brown, damp, soft		2														
	Increasing silt below 3.45 m, sand becoming finer, brown, saturated																
4.6	SILT: Some sand, trace silt, grey, saturated, very soft		3														
5.2	SAND: Trace to some silt, grey, saturated, soft		4														
6.1	END OF BOREHOLE Notes: 1) 50 mm diam. monitoring well installed upon completion, screened 2.13 to 5.18 mbgs 2) MW stick up = 0.88 m 3) Water Level Record: Date 31/05/2016 Depth (mbgs) 2.41		5														

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3 , × 3 : Numbers refer to Sensitivity

○ ε=3% Strain at Failure

PROJECT: Hydrogeological Investigation

CLIENT: Far Sight Homes

PROJECT LOCATION: 5426 - 5584 Lakeshore Road, Ballantrae, Ontario

DATUM: Geodetic

BH LOCATION:

DRILLING DATA

Method: Geoprobe 782DT

Diameter: 127 mm

Date: May/31/2016

REF. NO.: 161-06960-00

ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC NATURAL LIQUID LIMIT			POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)				W _p	W	W _L			
0.0	Ground Surface							20	40	60	80	100					
0.1	TOPSOIL: 130 mm, sandy topsoil, trace organics and rootlets, dark brown, damp		1					20	40	60	80	100					
1.6	SAND: Medium sand, trace silt, grey, damp to moist, loose		2					20	40	60	80	100					
3.0	SAND: Medium sand, trace silt, trace gravel, light brown to grey, wet to saturated, dense		3					20	40	60	80	100					
5.2	SAND: Medium to fine sand, trace gravel below 4.5 m, grey to brown, saturated, dense 2" coarse, wet to saturated sand seam at 3.05 m		4					20	40	60	80	100					
6.1	SILT: Trace clay, trace sand, grey saturated, soft, dense		5					20	40	60	80	100					
6.1	END OF BOREHOLE Notes: 1) 50 mm diam. monitoring well installed upon completion, screened 3.05 to 6.1 mbgs 2) MW stick up = 0.88 m 3) Water Level Record: Date 31/05/2016 Depth (mbgs) 2.0							20	40	60	80	100					

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3 , × 3 : Numbers refer to Sensitivity

○ ε=3% Strain at Failure

FAR SIGHT HOMES, BALLANTRAE, ONTARIO

161-06960-00

June 27, 2016

TEST PIT TP16-1

0.0 – 0.15 m TOP SOIL

0.15 – 0.90 m BROWN-ORANGE SILTY SAND, MOIST

0.90 – 3.10 m BROWN FINE TO MEDIUM SAND, TRACE SILT, MOIST

- SAMPLE S1 taken at 0.5 m BGS
- SAMPLE S2 taken at 1 m BGS (submitted for analysis)
- SAMPLE S3 taken at 2 m BGS (submitted for analysis)
- SAMPLE S4 taken at 3 m BGS (submitted for analysis)
- SEEPAGE AT 2.30 - 2.60 m BGS
- CANVING AND WET

TEST PIT TP16-2

0.0 – 0.30 m TOP SOIL

0.30 – 0.70 m BROWN, FINE TO MEDIUM SAND, MOIST

0.70 – 1.00 m BROWN GRAY, GRAVELY COARSE SAND, SOME PEBBLES, SOME COBBLES, TRACE SILT, MOIST

1.00 – 3.05 m BROWN FINE TO MEDIUM SAND, SOME SILT, TRACE GRAVEL, MOIST

- SAMPLE S1 taken at 0.5 m BGS
- SAMPLE S2 taken at 1 m BGS (submitted for analysis)
- SAMPLE S3 taken at 1.35 m BGS
- SAMPLE S4 taken at 2 m BGS (submitted for analysis)
- SAMPLE S5 taken at 3 m BGS (submitted for analysis)
- OPEN AND DRY

TEST PIT TP16-3

0.0 – 0.25 m TOP SOIL
0.25 – 0.80 m BROWN SAND, SOME SILT, MOIST
0.80 – 1.50 m BROWN SILT, SOME CLAY, TRACE SAND, MOIST
1.50 – 3.00 m BROWN SILT, TRACE TO SOME CLAY, TRACE SAND, MOIST

- SAMPLE S1 taken at 0.5 m BGS
- SAMPLE S2 taken at 1 m BGS (submitted for analysis)
- SAMPLE S3 taken at 2 m BGS (submitted for analysis)
- SAMPLE S4 taken at 3 m BGS (submitted for analysis)
- OPEN AND DRY

TEST PIT TP16-4

0.0 – 0.25 m TOPSOIL, BLACK, BROWN, SILTY SAND, ROOTLETS, MOIST
0.25 – 0.75 m BROWN SILTY SAND, MOIST
0.75 – 2.00 m BROWN CLAYEY SILT, TRACE SAND, MOIST
2.00 – 2.50 m BROWN SILT AND CLAY, SOME SAND, MOIST
2.50 – 3.20 m BROWN SAND, TRACE SILT, TRACE CLAY, MOIST TO WET

- SAMPLE S1 taken at 1 m BGS (submitted for analysis)
- SAMPLE S2 taken at 2 m BGS (submitted for analysis)
- SAMPLE S3 taken at 3 m BGS (submitted for analysis)
- SEEPAGE AT 2.00 -2.50 m BGS
- WET AND CAVING

BOREHOLE LOG EXPLANATION FORM

This explanatory section provides the background to assist in the use of the borehole logs. Each of the headings used on the borehole log, is briefly explained.

DEPTH

This column gives the depth of interpreted geologic contacts in metres below ground surface.

STRATIGRAPHIC DESCRIPTION

This column gives a description of the soil based on a tactile examination of the samples and/or laboratory test results. Each stratum is described according to the following classification and terminology.

<u>Soil Classification*</u>		<u>Terminology</u>	<u>Proportion</u>
Clay	<0.002 mm		
Silt	0.002 to 0.06 mm	"trace" (e.g. trace sand)	<10%
Sand	0.06 to 2 mm	"some" (e.g. some sand)	10% - 20%
Gravel	2 to 60 mm	adjective (e.g. sandy)	20% - 35%
Cobbles	60 to 200 mm	"and" (e.g. and sand)	35% - 50%
Boulders	>200 mm	noun (e.g. sand)	>50%

* Extension of MIT Classification system unless otherwise noted.

The use of the geologic term "till" implies that both disseminated coarser grained (sand, gravel, cobbles or boulders) particles and finer grained (silt and clay) particles may occur within the described matrix.

The compactness of cohesionless soils and the consistency of cohesive soils are defined by the following:

<u>COHESIONLESS SOIL</u>		<u>COHESIVE SOIL</u>	
Compactness	Standard Penetration Resistance "N", Blows / 0.3 m	Consistency	Standard Penetration Resistance "N", Blows / 0.3 m
Very Loose	0 to 4	Very Soft	0 to 2
Loose	4 to 10	Soft	2 to 4
Compact	10 to 30	Firm	4 to 8
Dense	30 to 50	Stiff	8 to 15
Very Dense	Over 50	Very Stiff	15 to 30
		Hard	Over 30

The moisture conditions of cohesionless and cohesive soils are defined as follows.

COHESIONLESS SOILS

Dry
Moist
Wet
Saturated

COHESIVE SOILS

DTPL - Drier Than Plastic Limit
APL - About Plastic Limit
WTPL - Wetter Than Plastic Limit
MWTPL - Much Wetter Than Plastic Limit

STRATIGRAPHY

Symbols may be used to pictorially identify the interpreted stratigraphy of the soil and rock strata.

MONITOR DETAILS

This column shows the position and designation of standpipe and/or piezometer ground water monitors installed in the borehole. Also the water level may be shown for the date indicated.

	Standpipe		Geotextile Material / Liner		Granular Backfill
	Piezometer		Borehole Seal (Bentonite Grout)		Granular (Filter) Pack
	Screened Interval		Cement Seal		Native Soil Backfill / Cave / Slough
	Borehole Seal (Peltonite, Bentonite or Hole Plug)				

Where monitors are placed in separate boreholes, these are shown individually in the "Monitor Details" column. Otherwise, monitors are in the same borehole. For further data regarding seals, screens, etc., the reader is referred to the summary of monitor details table.

SAMPLE

These columns describe the sample type and number, the "N" value, the water content, the percentage recovery, and Rock Quality Designation (RQD), of each sample obtained from the borehole where applicable. The information is recorded at the approximate depth at which the sample was obtained. The legend for sample type is explained below.

SS = Split Spoon	GS = Grab Sample
ST = Thin Walled Shelby Tube	CS = Channel Sample
AS = Auger Flight Sample	WS = Wash Sample
CC = Continuous Core	RC = Rock Core

$$\% \text{ Recovery} = \frac{\text{Length of Core Recovered Per Run}}{\text{Total Length of Run}} \times 100$$

Where rock drilling was carried out, the term RQD (Rock Quality Designation) is used. The RQD is an indirect measure of the number of fractures and soundness of the rock mass. It is obtained from the rock cores by summing the length of core recovered, counting only those pieces of sound core that are 100 mm or more in length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total length of core run. The classification based on the RQD value is given below.

RQD ClassificationRQD (%)

Very poor quality	< 25
Poor quality	25 - 50
Fair quality	50 - 75
Good quality	75 - 90
Excellent quality	90 - 100

TEST DATA

The central section of the log provides graphs which are used to plot selected field and laboratory test results at the depth at which they were carried out. The plotting scales are shown at the head of the column.

Dynamic Penetration Resistance - The number of blows required to advance a 51 mm diameter, 60° steel cone fitted to the end of 45 mm OD drill rods, 0.3 m into the subsoil. The cone is driven with a 63.5 kg hammer over a fall of 750 mm.

Standard Penetration Resistance - Standard Penetration Test (SPT) "N" Value - The number of blows required to advance a 51 mm diameter standard split-spoon sampler 300 mm into the subsoil, driven by means of a 63.5 kg hammer falling freely a distance of 750 mm. In cases where the split spoon does not penetrate 300 mm, the number of blows over the distance of actual penetration in millimetres is shown as $\frac{x\text{Blows}}{\text{mm}}$

Water Content - The ratio of the mass of water to the mass of oven-dry solids in the soil expressed as a percentage.

W_p - Plastic Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

W_L - Liquid Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

REMARKS

The last column describes pertinent drilling details, field observations and/or provides an indication of other field or laboratory tests that were performed.



BOREHOLE NO. MW15-1

PAGE 1 of 1

PROJECT NAME: 5452 LAKESHORE ROAD

PROJECT NO.: 141-15539-01 105

CLIENT: ALCORN & ASSOCIATES LTD.

DATE COMPLETED: Sep 14, 2015

BOREHOLE TYPE: 110 mm SOLID STEM AUGER

SUPERVISOR: KSR

GROUND ELEVATION: 334.0 mASL

REVIEWER: TVK

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE					CONE PENETRATION		WATER CONTENT %			REMARKS		
					TYPE	N VALUE	% WATER	% RECOVERY	ROD (%)	"N" VALUE			WATER CONTENT %				
										10	20	30	10	20		30	
0.0	334.0										SHEAR STRENGTH			W _p W _L			
0.1	333.9	TOPSOIL: DARK BROWN SILTY SAND TOPSOIL. SAND: BROWN FINE TO MEDIUM SAND, TRACE SILT, MOIST TO SATURATED.			SS1	4		33									
					SS2	4		100									
					SS3	14		100									
					SS4	18		83									
					SS5	19		92									
3.5	330.5	SANDY SILT: BROWN SANDY SILT, TRACE CLAY, MOIST TO WET.															
4.1	329.9	SAND: BROWN FINE TO MEDIUM SAND, TRACE SILT, MOIST TO SATURATED. - 5 cm SAND AND GRAVEL LAYER AT 4.15 m.			SS6	8		100									
4.6	329.4	SANDY SILT: BROWN SANDY SILT, TRACE CLAY, MOIST TO WET - 7.5 cm BROWN FINE TO MEDIUM SAND LAYER AT 5.12 m			SS7	22		100									
5.3	328.7	BOREHOLE TERMINATED AT 5.3 m IN SANDY SILT.															

WATER LEVEL MEASURED AT 2.89 mBGL ON 09/23/2015

WSP GEOLOGIC (METRIC) WITH MASL 141-1553-01 107-0 LOGS.GPJ WSP_ENV_V1.GDT 10/8/15



BOREHOLE NO. MW15-2

PAGE 1 of 1

PROJECT NAME: 5452 LAKESHORE ROAD

PROJECT NO.: 141-15539-01 105

CLIENT: ALCORN & ASSOCIATES LTD.

DATE COMPLETED: Sep 14, 2015

BOREHOLE TYPE: 110 mm SOLID STEM AUGER

SUPERVISOR: KSR

GROUND ELEVATION: 333.5 mASL

REVIEWER: TVK

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE					CONE PENETRATION		WATER CONTENT %		REMARKS		
					TYPE	N VALUE	% WATER	% RECOVERY	ROD (%)	"N" VALUE						
										10	20	30	10		20	30
										SHEAR STRENGTH			W _p W _L			
0.0	333.5															
0.2	333.3	TOPSOIL: LIGHT TO DARK BROWN SILTY SAND TOPSOIL. SAND: BROWN - GREY FINE TO MEDIUM SAND, TRACE SILT, TRACE GRAVEL, MOIST.			SS1	4		57								
1.5	332.0	SANDY SILT: BROWN - GREY SANDY SILT, TRACE CLAY, TRACE GRAVEL.			SS2	19		80								
2.1	331.4	SAND: GREY MEDIUM SAND, TRACE SILT, MOIST TO WET.			SS3	24		70								
4.6	328.9	SILTY SAND: GREY SILTY FINE SAND, WET TO SATURATED.			SS4	21		70								
5.3	328.2	BOREHOLE TERMINATED AT 5.3 m IN SILTY SAND.														

WATER LEVEL MEASURED AT 3.46 mBGL ON 09/23/2015

WSP GEOLOGIC (METRIC) WITH MASL 141-1553-01 107-0 LOGS.GPJ WSP_ENV_V1.GDT 10/8/15



BOREHOLE NO. MW15-3

PAGE 1 of 1

PROJECT NAME: 5452 LAKESHORE ROAD

PROJECT NO.: 141-15539-01 105

CLIENT: ALCORN & ASSOCIATES LTD.

DATE COMPLETED: Sep 14, 2015

BOREHOLE TYPE: 110 mm SOLID STEM AUGER

SUPERVISOR: KSR

GROUND ELEVATION: 332.5 mASL

REVIEWER: TVK

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE					CONE PENETRATION		WATER CONTENT %		REMARKS		
					TYPE	N VALUE	% WATER	% RECOVERY	ROD (%)	"N" VALUE						
										10	20	30	10		20	30
										SHEAR STRENGTH			W _p W _L			
0.0	332.5															
0.3	332.2	TOPSOIL: DARK BROWN SILTY SAND TOPSOIL.			SS1	3		57								
		SAND: LIGHT BROWN TO GREY FINE TO MEDIUM SAND, TRACE SILT, MOIST.			SS2	12		60								
1.7	330.8	SAND AND GRAVEL:														
1.9	330.6	COARSE SAND AND GRAVEL, TRACE COBBLE, MOIST.			SS3	14		63								
2.3	330.2	SILT: GREY SILT, SOME CLAY, TRACE SAND.														
		SILTY SAND: GREY SILTY SAND, TRACE CLAY, TRACE GRAVEL, WET TO SATURATED.			SS4	20		83								
					SS5	9		40								
					SS6	19		79								
5.0	327.5	SILT: GREY SILT, SOME SAND, TRACE CLAY, WET TO SATURATED.			SS7	14		83								
5.3	327.2	BOREHOLE TERMINATED AT 5.3 m IN SILT.														

WATER LEVEL MEASURED AT
2.38 mBGL ON 09/23/2015

PROJECT NAME: 5452 LAKESHORE ROAD

PROJECT NO.: 141-15539-01 105

CLIENT: ALCORN & ASSOCIATES LTD.

DATE COMPLETED: Sep 14, 2015

BOREHOLE TYPE: 110 mm SOLID STEM AUGER

SUPERVISOR: KSR

GROUND ELEVATION: 334.0 mASL

REVIEWER: TVK

[illegible]



BOREHOLE NO. MW15-5

PAGE 1 of 1

PROJECT NAME: 5452 LAKESHORE ROAD

PROJECT NO.: 141-15539-01 105

CLIENT: ALCORN & ASSOCIATES LTD.

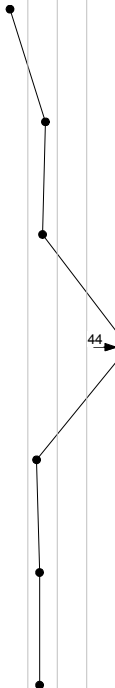
DATE COMPLETED: Sep 14, 2015

BOREHOLE TYPE: 110 mm SOLID STEM AUGER

SUPERVISOR: KSR

GROUND ELEVATION: 334.0 mASL

REVIEWER: TVK

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE					CONE PENETRATION		WATER CONTENT %			REMARKS	
					TYPE	N VALUE	% WATER	% RECOVERY	ROD (%)	"N" VALUE			WATER CONTENT %			
										10	20	30	10	20		30
0.0	334.0															
0.3	333.7	TOPSOIL: BROWN SILTY SAND TOPSOIL SAND: BROWN MEDIUM TO FINE SAND, TRACE TO SOME SILT, TRACE TO SOME GRAVEL, MOIST TO WET. - GREY BELOW 1.0 m - SATURATED BELOW 3.7 m		SS1	4		67						WATER LEVEL MEASURED AT 3.62 mBGL ON 09/23/2015			
		SS2		16		67										
		SS3		15		73										
		SS4		44		73										
		SS5		13		60										
		SS6		14		90										
4.0	330.0	SILTY SAND: BROWN AND GREY SILTY SAND, TRACE CLAY, SATURATED.														
4.6	329.4	SAND: LIGHT BROWN COARSE TO FINE SAND, SOME SILT, TRACE CLAY, SATURATED.			SS7	14		87								
5.3	328.7	BOREHOLE TERMINATED AT 5.3 m IN SAND.														

WATER LEVEL MEASURED AT 3.62 mBGL ON 09/23/2015

WSP GEOLOGIC (METRIC) WITH MASL 141-1553-01 107-0 LOGS.GPJ WSP_ENV_V1.GDT 10/8/15



BOREHOLE NO. MW15-6

PAGE 1 of 1

PROJECT NAME: 5452 LAKESHORE ROAD

PROJECT NO.: 141-15539-01 105

CLIENT: ALCORN & ASSOCIATES LTD.

DATE COMPLETED: Sep 14, 2015

BOREHOLE TYPE: 110 mm SOLID STEM AUGER

SUPERVISOR: KSR

GROUND ELEVATION: 333.5 mASL

REVIEWER: TVK

DEPTH (m)	ELEV (masl)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE					CONE PENETRATION		WATER CONTENT %		REMARKS		
					TYPE	N VALUE	% WATER	% RECOVERY	ROD (%)	"N" VALUE						
										10	20	30	10		20	30
										SHEAR STRENGTH			W _p W _L			
0.0	333.5															
0.2	333.3	TOPSOIL: BROWN SILTY SAND TOPSOIL. SAND: BROWN AND GREY FINE TO MEDIUM SAND, TRACE TO SOME SILT, TRACE CLAY MOIST.			SS1	3		40								
					SS2	15		63								
3.0	330.5	SILTY SAND: GREY SILTY SAND, WET TO SATURATED.			SS3	20		70								
3.8	329.7	SILTY SAND TO SANDY SILT: GREY SILTY SAND TO SANDY SILT, TRACE TO SOME CLAY, SATURATED.														
					SS4	26		60								
5.3	328.2	BOREHOLE TERMINATED AT 5.3 m IN SAND.														

WATER LEVEL MEASURED AT
3.73 mBGL ON 09/23/2015

Table 1 – Test Pit Logs
 141-15539-00
 5452 Lakeshore Road, Ballantrae

<u>Depth</u>	<u>Description</u>
TP14-01	
0.00 – 0.12 m	Brown-black silty sand topsoil, trace rootlets, moist.
0.12 – 0.90 m	Brown fine sand, some silt, moist.
0.90 – 2.30 m	Grey silty sand, trace clay, trace gravel, moist.
2.30 – 3.00 m	Grey coarse sand, some gravel, trace cobble, moist to wet.
3.00 – 3.10 m	Grey clayey silt, trace sand, trace gravel, moist to wet.
	➤ Sample #1 taken at 0.2 – 0.5 m. ➤ Sample #2 taken at 1.0 – 1.2 m (Submitted). ➤ Sample #3 taken at 2.3 – 2.7 m. ➤ Sample #4 taken at 3.0 – 3.1 m. ➤ Groundwater seepage at 2.3 m.
TP14-02	
0.00 – 0.17 m	Brown-black silty sand topsoil, trace rootlets, moist.
0.17 – 1.80 m	Brown fine sand, some silt, trace clay moist.
1.80 – 2.20 m	Grey fine sand, some silt, trace clay moist.
2.20 – 2.50 m	Grey coarse sand, some gravel, some pebble, trace cobble, moist to wet.
2.50 – 3.00 m	Grey clayey silt, trace sand, trace gravel, moist to wet.
	➤ Sample #1 taken at 0.5 – 0.8 m (Submitted). ➤ Sample #2 taken at 2.0 – 2.2 m. ➤ Sample #3 taken at 2.2 – 2.5 m. ➤ Sample #4 taken at 2.8 – 3.0 m. ➤ Groundwater seepage at 2.2 m.
TP14-03	
0.00 – 0.22 m	Brown-black silty sand topsoil, trace rootlets, moist.
0.22 – 0.70 m	Brown fine sand, some silt, trace clay, moist.
0.70 – 2.20 m	Grey silt and sand, trace clay, moist.
2.20 – 3.05 m	Grey coarse sand, some gravel, some pebble, trace cobble, moist to wet.

- Sample #1 taken at 0.5 – 0.7 m.
- Sample #2 taken at 2.0 – 2.2 m (Submitted).
- Sample #3 taken at 2.2 – 2.4 m.
- Sample #4 taken at 2.9 – 3.05 m.
- Groundwater seepage at 2.2 m.

TP14-04

0.00 – 0.10 m

Brown-black silty sand topsoil, trace rootlets, moist.

0.10 – 2.20 m

Brown fine sand, some silt, trace clay, moist.

2.20 – 3.10 m

Grey fine sand, some silt, trace clay, moist.

3.10 – 4.50 m

Grey clayey silt, trace sand, trace gravel, moist to wet.

- Sample #1 taken at 0.5 – 0.8 m (Submitted).
- Sample #2 taken at 2.0 – 2.2 m.
- Sample #3 taken at 2.8 – 3.0 m.
- Sample #4 taken at 4.0 – 4.5 m.
- Groundwater seepage at 2.2 m.

TP14-05

0.00 – 0.18 m

Brown-black silty sand topsoil, trace rootlets, moist.

0.18 – 1.30 m

Brown fine sand, some silt, moist.

1.30 – 2.15 m

Grey medium sand, trace silt, trace clay, moist.

2.15 – 3.00 m

Grey clayey silt, trace sand, trace gravel, moist to wet.

- Sample #1 taken at 0.5 – 0.8 m.
- Sample #2 taken at 1.8 – 2.15 m (Submitted).
- Sample #3 taken at 2.7 – 3.0 m (Submitted).
- No seepage.

TP14-06

0.00 – 0.12 m

Brown-black silty sand topsoil, trace rootlets, moist.

0.18 – 1.70 m

Brown fine sand, some silt, trace clay, moist.

1.70 – 3.30 m

Grey clayey silt, trace sand, trace gravel, moist.

3.30 – 4.40 m

Grey medium sand, moist to wet.

- Sample #1 taken at 0.2 – 1.0 m (Submitted).
- Sample #2 taken at 3.0 – 3.3 m.
- Sample #3 taken at 4.0 – 4.4 m.
- Groundwater seepage at 4.3 m.

APPENDIX

D

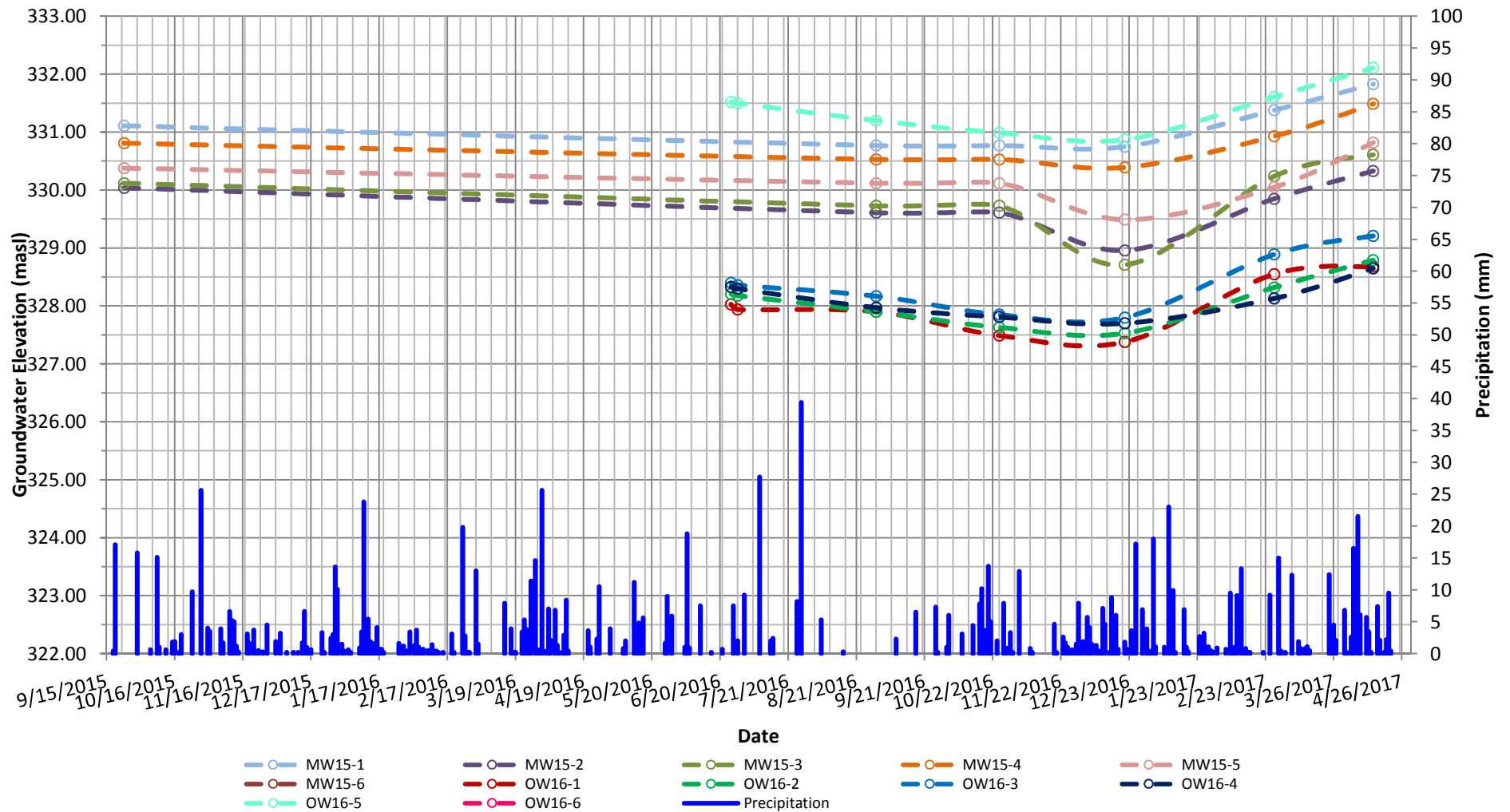
BI-MONTHLY
MONITORING

Table D-1 - Bi-Monthly Monitoring Groundwater Elevations
5426, 5452 5584 Lakeshore Road, Ballantrae, ON
Town of Whitchurch-Stouffville

Well ID	Easting	Northing	Ground Surface Elevation (masl)	Stick Up (m)	Well Depth (mbgs)	23-Sep-15		25-Jun-16		28-Jun-16		30-Aug-16		25-Oct-16		21-Dec-16		27-Feb-17		13-Apr-17	
						Depth to Water (mbgs)	Water Level Elevation (masl)	Depth to Water (mbgs)	Water Level Elevation (masl)	Depth to Water (mbgs)	Water Level Elevation (masl)	Depth to Water (mbgs)	Water Level Elevation (masl)	Depth to Water (mbgs)	Water Level Elevation (masl)	Depth to Water (mbgs)	Water Level Elevation (masl)	Depth to Water (mbgs)	Water Level Elevation (masl)	Depth to Water (mbgs)	Water Level Elevation (masl)
MW15-1	637023	4877197	334.0	0.75	4.68	2.89	331.11	-	-	-	-	3.23	330.77	3.24	330.76	3.25	330.75	2.62	331.38	2.17	331.83
MW15-2	637040	4877136	333.5	0.71	4.63	3.46	330.04	-	-	-	-	3.89	329.61	4.54	328.96	4.54	328.96	3.65	329.85	3.17	330.33
MW15-3	637104	4877164	332.5	0.67	3.86	2.38	330.12	-	-	-	-	2.77	329.73	3.15	329.35	3.79	328.71	2.26	330.24	1.89	330.61
MW15-4	637158	4877130	334.0	0.76	4.40	3.19	330.81	-	-	-	-	3.47	330.53	3.64	330.36	3.61	330.39	3.07	330.93	2.51	331.49
MW15-5	637148	4877105	334.0	0.73	4.57	3.62	330.38	-	-	-	-	3.88	330.12	4.24	329.76	4.51	329.49	3.95	330.05	3.18	330.82
MW15-6	637092	4877133	333.5	0.84	4.57	3.73	329.77	-	-	-	-	4.14	329.36	4.57	328.93	dry	-	3.03	330.47	2.62	330.88
OW16-1			328.9	0.86	6.01	-	-	0.85	328.03	0.94	327.94	0.98	327.90	1.39	327.49	1.50	327.38	0.33	328.55	0.20	328.68
OW16-2			331.4	0.86	6.00	-	-	3.19	328.21	3.22	328.18	3.50	327.90	3.77	327.63	3.87	327.53	3.08	328.32	2.61	328.79
OW16-3			330.1	0.83	6.02	-	-	1.70	328.40	1.74	328.36	1.93	328.17	2.25	327.85	2.30	327.80	1.21	328.89	0.89	329.21
OW16-4			331.4	0.81	5.89	-	-	3.06	328.33	3.09	328.30	3.42	327.97	3.58	327.81	3.69	327.70	3.26	328.13	2.74	328.65
OW16-5			334.1	0.84	5.00	-	-	2.62	331.52	2.64	331.50	2.94	331.20	3.15	330.99	3.27	330.87	2.53	331.61	2.03	332.11
OW16-6			333.2	0.88	5.96	-	-	2.30	330.89	2.23	330.96	2.43	330.76	2.52	330.67	2.42	330.77	1.73	331.46	1.51	331.68

Water Level Hydrograph

Monitoring Wells and Precipitation



* Notes: Climate data obtained from Uxbridge West Climate Station

2016-2017 Water Level Monitoring

Farsight Homes

5426 - 5584 Lakeshore Road, Ballantrae, ON

April 2017

FIGURE D-1



APPENDIX

E

IN-SITU HYDRAULIC CONDUCTIVITY TESTING



Slug Test - Analyses Report

D-1

Project: 5426, 5452 & 5584 Lakeshore Rd.

Number: 161-06960-00

Client: Far Sight Homes

Location: Ballantrae, ON

Slug Test: OW16-1

Test Well: OW16-1

Test Conducted by: SJD

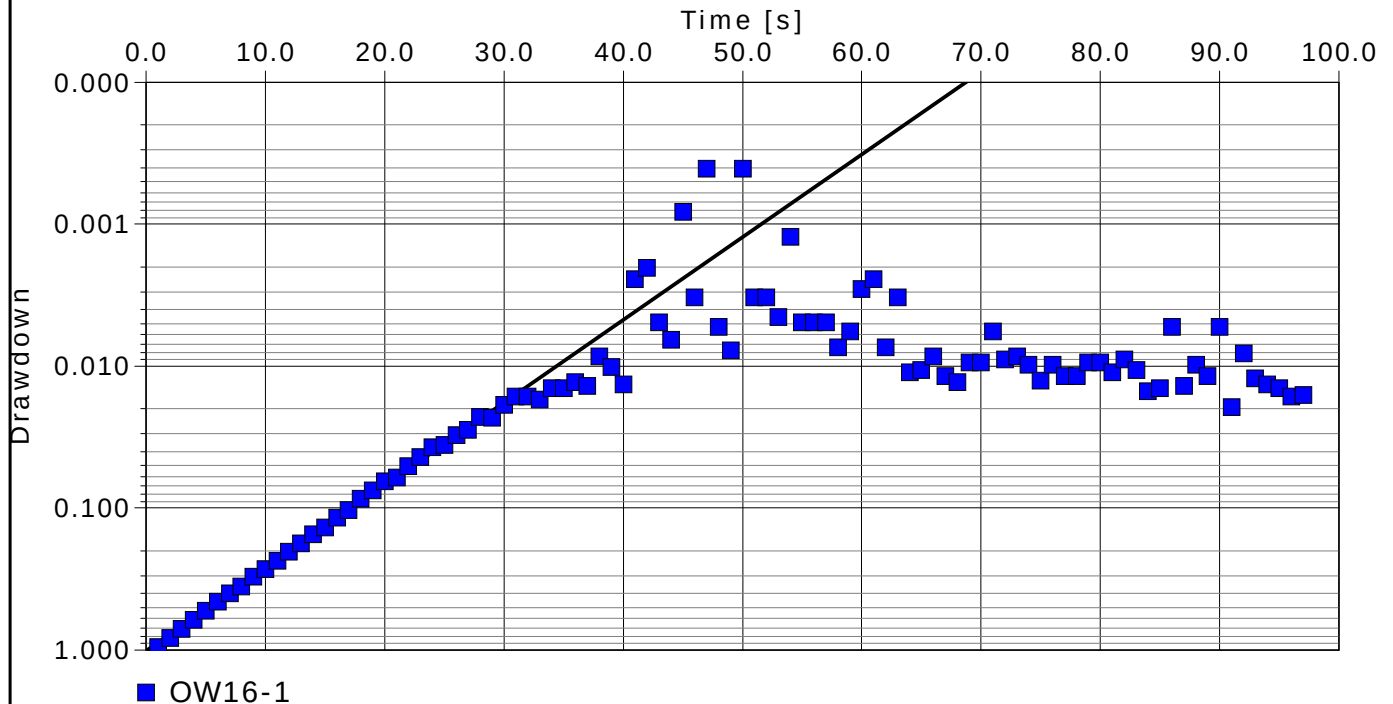
Test Date: 27/06/2016

Analysis Performed by: SJD

OW16-1 Rising Head Test

Analysis Date: 11/08/2016

Aquifer Thickness: 5.16 m



Calculation using Hvorslev

Observation Well

Hydraulic
Conductivity
[m/s]

OW16-1

6.89×10^{-5}

				Slug Test - Analyses Report				D-1	
				Project: 5426, 5452 & 5584 Lakeshore Rd.					
				Number: 161-06960-00					
				Client: Far Sight Homes					
Location: Ballantrae, ON			Slug Test: OW16-1			Test Well: OW16-1			
Test Conducted by: SJD						Test Date: 27/06/2016			
Aquifer Thickness: 5.16 m									
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S	
1	OW16-1 Rising Head	SJD	11/08/2016	Hvorslev	OW16-1		6.89×10^{-5}		



Slug Test Analysis Report

D-2

Project: 5426, 5452 & 5584 Lakeshore Rd.

Number: 161-06960-00

Client: Far Sight Homes

Location: Ballantrae, ON

Slug Test: OW16-2

Test Well: OW16-2

Test Conducted by: SJD

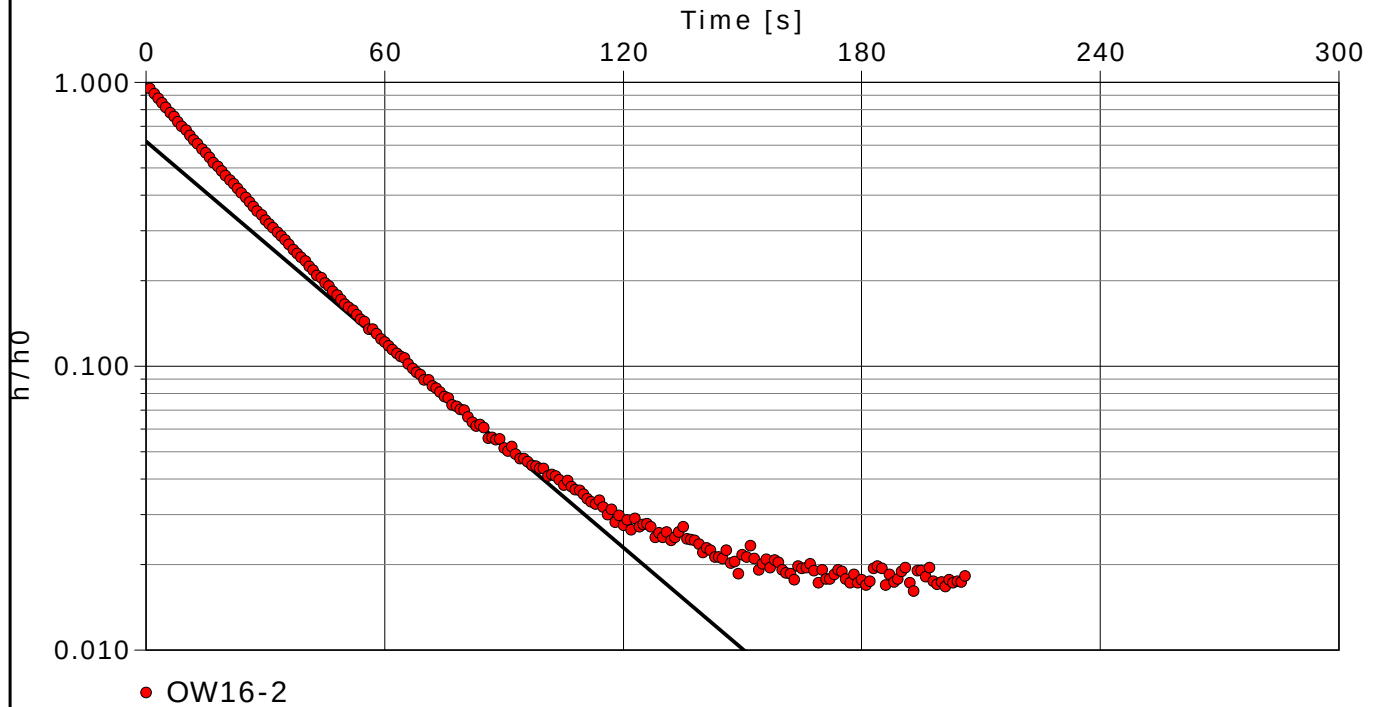
Test Date: 30/06/2016

Analysis Performed by:

OW16-2 Rising Head Test

Analysis Date: 11/08/2016

Aquifer Thickness: 2.88 m



Calculation using Hvorslev

Observation Well

Hydraulic
Conductivity
[m/s]

OW16-2

1.47×10^{-5}

				Slug Test - Analyses Report				D-2	
				Project: 5426, 5452 & 5584 Lakeshore Rd.					
				Number: 161-06960-00					
				Client: Far Sight Homes					
Location: Ballantrae, ON			Slug Test: OW16-2			Test Well: OW16-2			
Test Conducted by: SJD						Test Date: 30/06/2016			
Aquifer Thickness: 2.88 m									
	Analysis Name	Analysis Performed	Analysis Date	Method name	Well	T [m ² /s]	K [m/s]	S	
1	OW16-2 Rising Head Test		11/08/2016	Hvorslev	OW16-2		1.47 × 10 ⁻⁵		



Slug Test Analysis Report

D-3

Project: 5426, 5452 & 5584 Lakeshore Rd.

Number: 161-06960-00

Client: Far Sight Homes

Location: Ballantrae, ON

Slug Test: OW16-3

Test Well: OW16-3

Test Conducted by: SJD

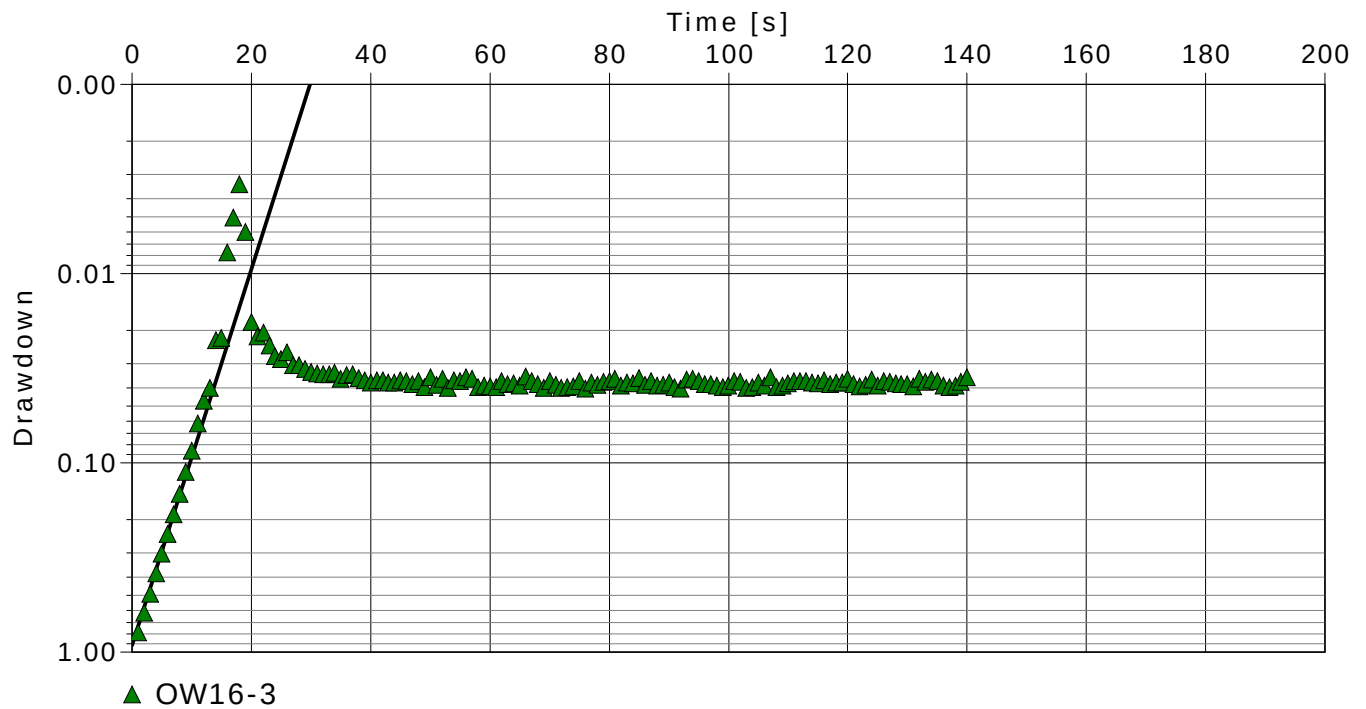
Test Date: 30/06/2016

Analysis Performed by: SJD

OW16-3 Rising Head

Analysis Date: 11/08/2016

Aquifer Thickness: 4.36 m



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
OW16-3	1.17×10^{-4}	

				Slug Test - Analyses Report D-3				
				Project: 5426, 5452 & 5584 Lakeshore Rd.				
				Number: 161-06960-00				
				Client: Far Sight Homes				
Location: Ballantrae, ON			Slug Test: OW16-3		Test Well: OW16-3			
Test Conducted by: SJD					Test Date: 30/06/2016			
Aquifer Thickness: 4.36 m								
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [m ² /s]	K [m/s]	S
1	OW16-3 Rising Head	SJD	11/08/2016	Hvorslev	OW16-3		1.17 × 10 ⁻⁴	



Slug Test Analysis Report

D-4

Project: 5426, 5452 & 5584 Lakeshore Rd.

Number: 161-06960-00

Client: Far Sight Homes

Location: Ballantrae, ON

Slug Test: OW16-4

Test Well: OW16-4

Test Conducted by: SJD

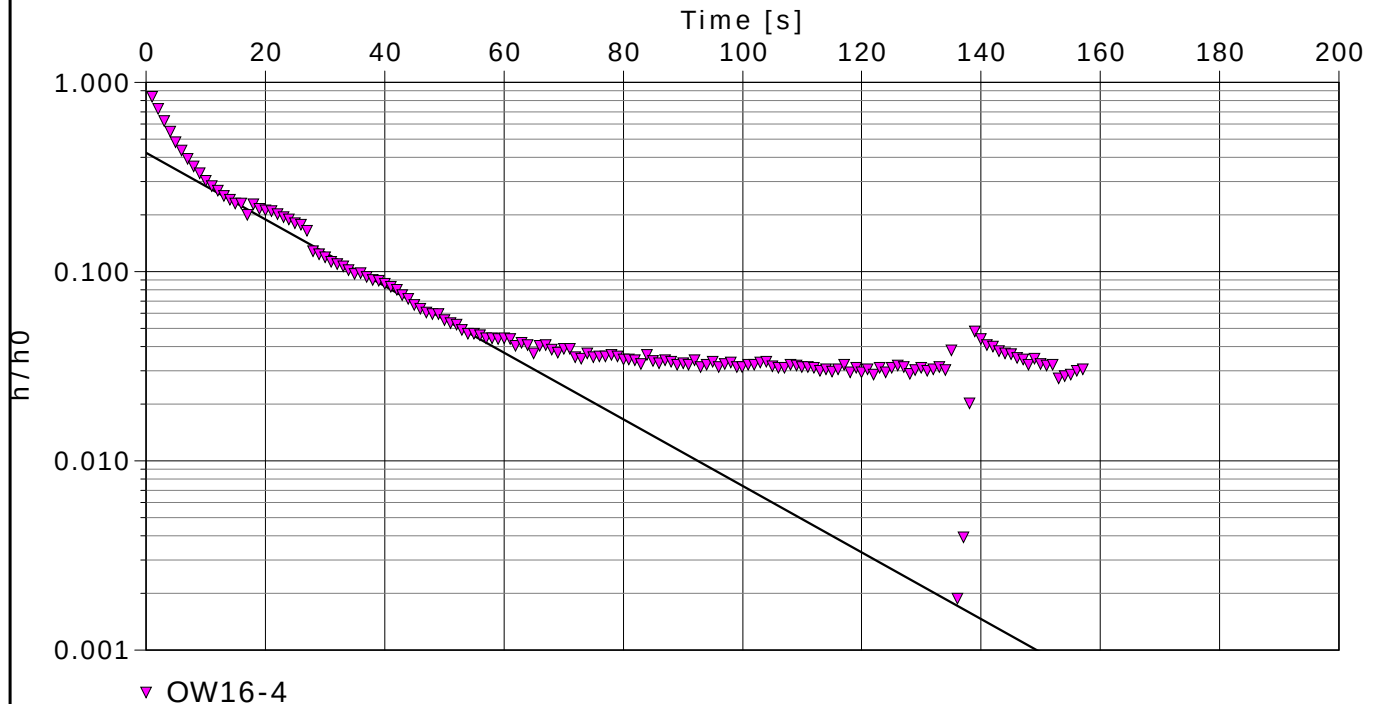
Test Date: 30/06/2016

Analysis Performed by: SJD

OW16-4 Rising Head

Analysis Date: 11/08/2016

Aquifer Thickness: 3.01 m



Calculation using Hvorslev

Observation Well

Hydraulic
Conductivity
[m/s]

OW16-4

2.10×10^{-5}



Slug Test Analysis Report

D-4

Project: 5426, 5452 & 5584 Lakeshore Rd.

Number: 161-06960-00

Client: Far Sight Homes

Location: Ballantrae, ON

Slug Test: OW16-4

Test Well: OW16-4

Test Conducted by: SJD

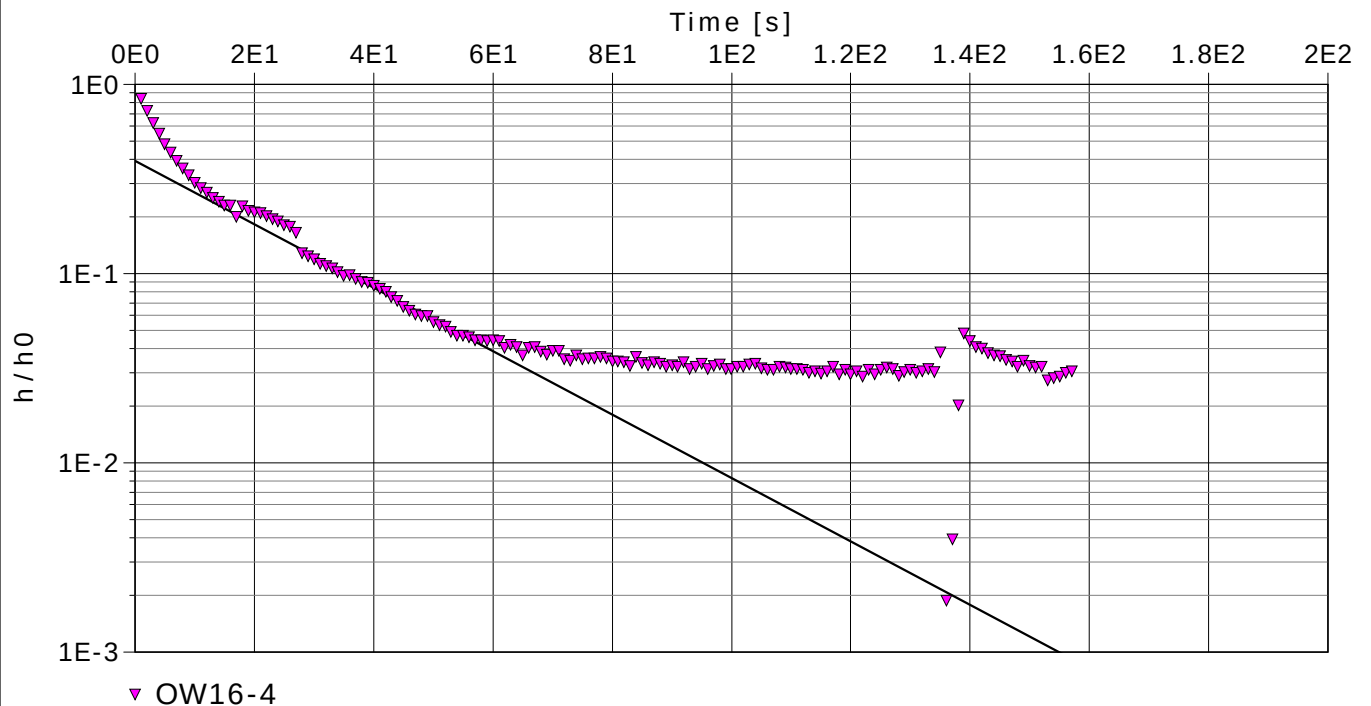
Test Date: 30/06/2016

Analysis Performed by: SJD

OW16-4

Analysis Date: 11/08/2016

Aquifer Thickness: 3.01 m



Calculation using Hvorslev

Observation Well

Hydraulic
Conductivity
[m/s]

OW16-4

2.00×10^{-5}

				Slug Test - Analyses Report				D-4			
				Project: 5426, 5452 & 5584 Lakeshore Rd.							
				Number: 161-06960-00							
				Client: Far Sight Homes							
Location: Ballantrae, ON			Slug Test: OW16-4			Test Well: OW16-4					
Test Conducted by: SJD						Test Date: 30/06/2016					
Aquifer Thickness: 3.01 m											
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S			
1	OW16-4 Rising Head	SJD	11/08/2016	Hvorslev	OW16-4		2.10×10^{-5}				
2	OW16-4	SJD	11/08/2016	Hvorslev	OW16-4		2.00×10^{-5}				



Slug Test Analysis Report

D-5

Project: 5426, 5452 & 5584 Lakeshore Rd.

Number: 161-06960-00

Client: Far Sight Homes

Location: Ballantrae, ON

Slug Test: OW16-5

Test Well: OW16-5

Test Conducted by: SJD

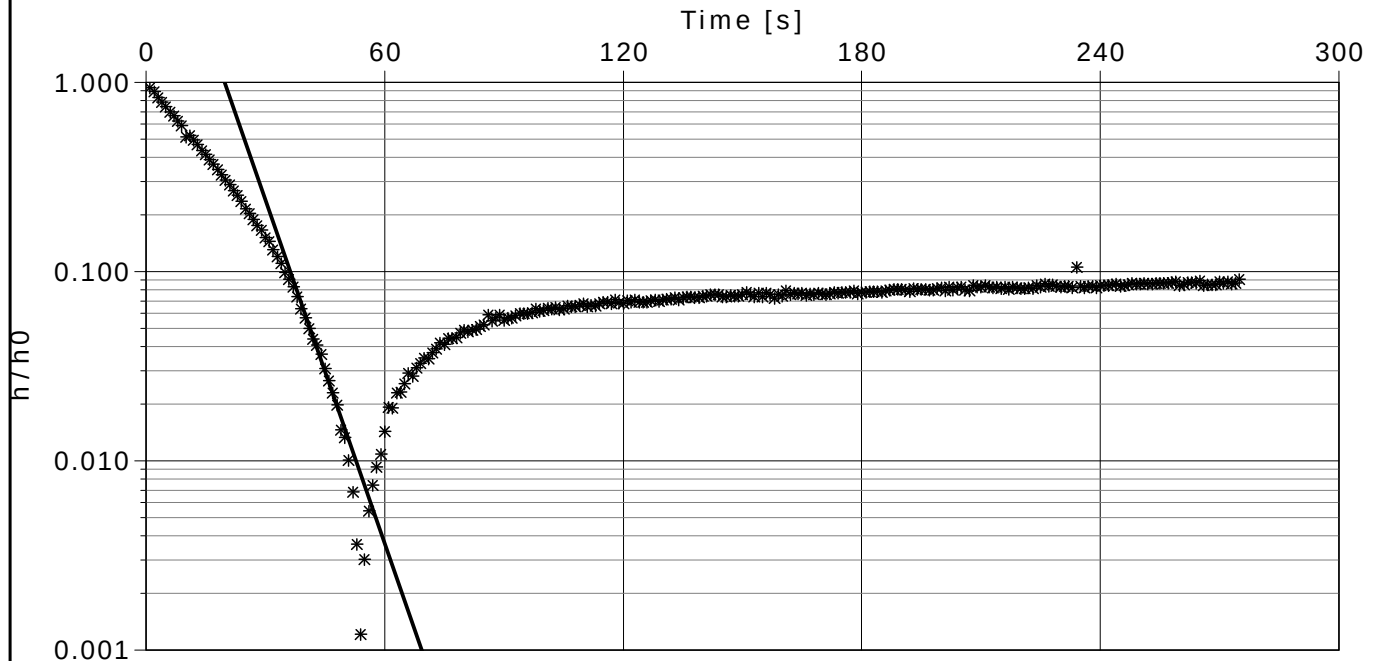
Test Date: 30/06/2016

Analysis Performed by: SJD

OW16-5 Rising Head

Analysis Date: 12/08/2016

Aquifer Thickness: 2.56 m



Calculation using Hvorslev

Observation Well

Hydraulic
Conductivity
[m/s]

OW16-5

8.20×10^{-5}

				Slug Test - Analyses Report				D-5	
				Project: 5426, 5452 & 5584 Lakeshore Rd.					
				Number: 161-06960-00					
				Client: Far Sight Homes					
Location: Ballantrae, ON			Slug Test: OW16-5			Test Well: OW16-5			
Test Conducted by: SJD						Test Date: 30/06/2016			
Aquifer Thickness: 2.56 m									
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [m ² /s]	K [m/s]	S	
1	OW16-5 Rising Head	SJD	12/08/2016	Hvorslev	OW16-5		8.20 × 10 ⁻⁵		



Slug Test Analysis Report

D-6

Project: 5426, 5452 & 5584 Lakeshore Rd.

Number: 161-06960-00

Client: Far Sight Homes

Location: Ballantrae, ON

Slug Test: OW16-6

Test Well: OW16-6

Test Conducted by: SJD

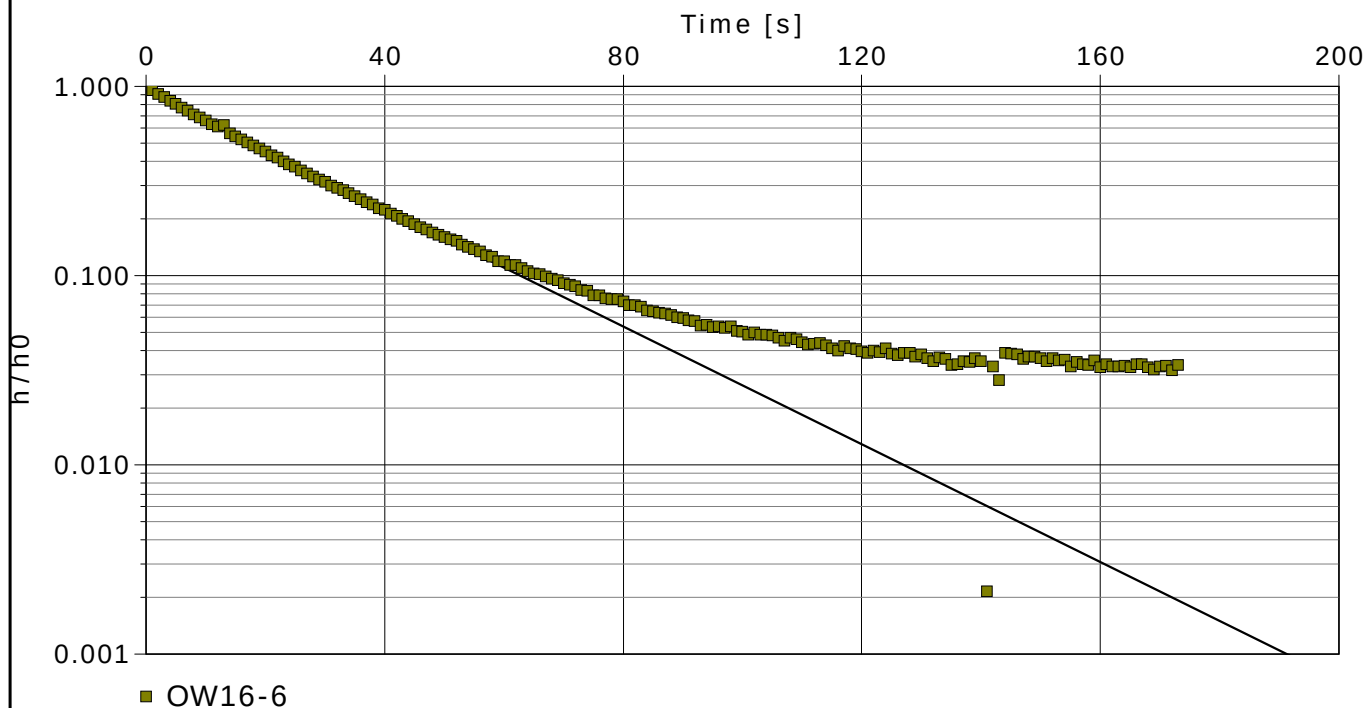
Test Date: 30/06/2016

Analysis Performed by: SJD

OW16-6 Rising Head

Analysis Date: 12/08/2016

Aquifer Thickness: 3.87 m



Calculation using Hvorslev

Observation Well

Hydraulic
Conductivity
[m/s]

OW16-6

1.84×10^{-5}

				Slug Test - Analyses Report				D-6	
				Project: 5426, 5452 & 5584 Lakeshore Rd.					
				Number: 161-06960-00					
				Client: Far Sight Homes					
Location: Ballantrae, ON			Slug Test: OW16-6			Test Well: OW16-6			
Test Conducted by: SJD						Test Date: 30/06/2016			
Aquifer Thickness: 3.87 m									
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [m ² /s]	K [m/s]	S	
1	OW16-6 Rising Head	SJD	12/08/2016	Hvorslev	OW16-6		1.84 × 10 ⁻⁵		

APPENDIX

F

WATER QUALITY

Your Project #: 161-06960-00 /105
Site#: Farsight Development
Your C.O.C. #: 567024-01-01

Attention:Tanya Kizovski

WSP Canada Inc
126 Don Hillock Dr
Unit 2
Aurora, ON
L4G 0G9

Report Date: 2016/07/08
Report #: R4056908
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6D6032

Received: 2016/07/02, 09:10

Sample Matrix: Water
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	7	N/A	2016/07/04	CAM SOP-00448	SM 22 2320 B m
Carbonate, Bicarbonate and Hydroxide	7	N/A	2016/07/05	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	7	N/A	2016/07/05	CAM SOP-00463	EPA 325.2 m
Conductivity	7	N/A	2016/07/04	CAM SOP-00414	SM 22 2510 m
Dissolved Organic Carbon (DOC) (1)	7	N/A	2016/07/06	CAM SOP-00446	SM 22 5310 B m
Hardness (calculated as CaCO3)	7	N/A	2016/07/07	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals Analysis by ICP	5	2016/07/04	2016/07/06	CAM SOP-00408	EPA 6010C m
Dissolved Metals Analysis by ICP	2	2016/07/08	2016/07/08	CAM SOP-00408	EPA 6010C m
Ion Balance (% Difference)	7	N/A	2016/07/07		
Anion and Cation Sum	7	N/A	2016/07/07		
Total Ammonia-N	7	N/A	2016/07/07	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	7	N/A	2016/07/05	CAM SOP-00440	SM 22 4500-NO3I/NO2B
pH	7	N/A	2016/07/04	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	7	N/A	2016/07/05	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	7	N/A	2016/07/07		
Sat. pH and Langelier Index (@ 4C)	7	N/A	2016/07/07		
Sulphate by Automated Colourimetry	7	N/A	2016/07/05	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	7	N/A	2016/07/07		

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your Project #: 161-06960-00 /105
Site#: Farsight Development
Your C.O.C. #: 567024-01-01

Attention:Tanya Kizovski

WSP Canada Inc
126 Don Hillock Dr
Unit 2
Aurora, ON
L4G 0G9

Report Date: 2016/07/08
Report #: R4056908
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6D6032

Received: 2016/07/02, 09:10

- (1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
- (2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ashton Gibson, Project Manager

Email: AGibson@maxxam.ca

Phone# (905) 817-5700

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

RCAP - ROUTINE (WATER)

Maxxam ID		CQE362		CQE363		CQE364		
Sampling Date		2016/06/30		2016/06/30		2016/06/30		
COC Number		567024-01-01		567024-01-01		567024-01-01		
	UNITS	OW1	RDL	OW2	RDL	OW3	RDL	QC Batch
Calculated Parameters								
Anion Sum	me/L	7.88	N/A	5.65	N/A	7.77	N/A	4562949
Bicarb. Alkalinity (calc. as CaCO ₃)	mg/L	250	1.0	180	1.0	320	1.0	4562947
Calculated TDS	mg/L	440	1.0	350	1.0	430	1.0	4562952
Carb. Alkalinity (calc. as CaCO ₃)	mg/L	2.0	1.0	1.4	1.0	2.1	1.0	4562947
Cation Sum	me/L	8.50	N/A	6.21	N/A	8.49	N/A	4562949
Hardness (CaCO ₃)	mg/L	290	1.0	300	1.0	370	1.0	4562897
Ion Balance (% Difference)	%	3.75	N/A	4.73	N/A	4.42	N/A	4562948
Langelier Index (@ 20C)	N/A	0.916		0.817		1.03		4562950
Langelier Index (@ 4C)	N/A	0.668		0.569		0.786		4562951
Saturation pH (@ 20C)	N/A	7.02		7.11		6.81		4562950
Saturation pH (@ 4C)	N/A	7.27		7.36		7.06		4562951
Inorganics								
Total Ammonia-N	mg/L	0.30	0.050	0.097	0.050	0.082	0.050	4564251
Conductivity	umho/cm	780	1.0	570	1.0	750	1.0	4563944
Dissolved Organic Carbon	mg/L	3.3	0.20	3.0	0.20	1.8	0.20	4563558
Orthophosphate (P)	mg/L	<0.010	0.010	<0.010	0.010	<0.010	0.010	4563634
pH	pH	7.94		7.93		7.84		4563946
Dissolved Sulphate (SO ₄)	mg/L	10	1.0	16	1.0	13	1.0	4563635
Alkalinity (Total as CaCO ₃)	mg/L	250	1.0	180	1.0	320	1.0	4563947
Dissolved Chloride (Cl)	mg/L	93	1.0	24	1.0	38	1.0	4563631
Nitrite (N)	mg/L	<0.010	0.010	<0.010	0.010	0.141	0.010	4564993
Nitrate (N)	mg/L	<0.10	0.10	15.0	0.50	0.37	0.10	4564993
Metals								
Dissolved Calcium (Ca)	mg/L	110	0.05	120	0.05	140	0.05	4563880
Dissolved Copper (Cu)	mg/L	<0.02	0.02	<0.02	0.02	<0.02	0.02	4563880
Dissolved Iron (Fe)	mg/L	0.16	0.02	<0.02	0.02	0.31	0.02	4563880
Dissolved Magnesium (Mg)	mg/L	4.7	0.05	2.8	0.05	5.5	0.05	4563880
Dissolved Manganese (Mn)	mg/L	0.39	0.01	0.03	0.01	0.65	0.01	4563880
Dissolved Potassium (K)	mg/L	3	1	3	1	4	1	4563880
Dissolved Sodium (Na)	mg/L	61	0.5	2.2	0.5	24	0.5	4563880
Dissolved Zinc (Zn)	mg/L	<0.01	0.01	<0.01	0.01	0.01	0.01	4563880
RDL = Reportable Detection Limit								
QC Batch = Quality Control Batch								
N/A = Not Applicable								

RCAP - ROUTINE (WATER)

Maxxam ID		CQE365	CQE365			CQE366	CQE366		
Sampling Date		2016/06/30	2016/06/30			2016/06/30	2016/06/30		
COC Number		567024-01-01	567024-01-01			567024-01-01	567024-01-01		
	UNITS	OW4	OW4 Lab-Dup	RDL	QC Batch	OW5	OW5 Lab-Dup	RDL	QC Batch

Calculated Parameters

Anion Sum	me/L	5.02		N/A	4562949	5.06		N/A	4562949
Bicarb. Alkalinity (calc. as CaCO ₃)	mg/L	160		1.0	4562947	240		1.0	4562947
Calculated TDS	mg/L	320		1.0	4562952	280		1.0	4562952
Carb. Alkalinity (calc. as CaCO ₃)	mg/L	1.8		1.0	4562947	1.9		1.0	4562947
Cation Sum	me/L	6.16		N/A	4562949	5.72		N/A	4562949
Hardness (CaCO ₃)	mg/L	290		1.0	4562897	280		1.0	4562897
Ion Balance (% Difference)	%	10.2		N/A	4562948	6.12		N/A	4562948
Langelier Index (@ 20C)	N/A	0.876			4562950	0.913			4562950
Langelier Index (@ 4C)	N/A	0.627			4562951	0.663			4562951
Saturation pH (@ 20C)	N/A	7.18			4562950	7.01			4562950
Saturation pH (@ 4C)	N/A	7.43			4562951	7.26			4562951

Inorganics

Total Ammonia-N	mg/L	0.49		0.050	4564251	<0.050		0.050	4564251
Conductivity	umho/cm	490		1.0	4563944	470		1.0	4563944
Dissolved Organic Carbon	mg/L	1.7		0.20	4565985	1.9		0.20	4563558
Orthophosphate (P)	mg/L	<0.010	<0.010	0.010	4564031	<0.010		0.010	4563634
pH	pH	8.06			4563946	7.92			4563946
Dissolved Sulphate (SO ₄)	mg/L	20	20	1.0	4564022	6.1		1.0	4563635
Alkalinity (Total as CaCO ₃)	mg/L	170		1.0	4563947	240		1.0	4563947
Dissolved Chloride (Cl)	mg/L	7.3	7.3	1.0	4564030	3.8		1.0	4563631
Nitrite (N)	mg/L	0.065		0.010	4563649	<0.010		0.010	4564993
Nitrate (N)	mg/L	14.8		0.50	4563649	0.60		0.10	4564993

Metals

Dissolved Calcium (Ca)	mg/L	110		0.05	4563880	110	110	0.05	4563880
Dissolved Copper (Cu)	mg/L	<0.02		0.02	4563880	<0.02	<0.02	0.02	4563880
Dissolved Iron (Fe)	mg/L	<0.02		0.02	4563880	<0.02	0.02	0.02	4563880
Dissolved Magnesium (Mg)	mg/L	7.1		0.05	4563880	3.6	3.6	0.05	4563880
Dissolved Manganese (Mn)	mg/L	0.12		0.01	4563880	0.02	0.02	0.01	4563880
Dissolved Potassium (K)	mg/L	4		1	4563880	<1	<1	1	4563880
Dissolved Sodium (Na)	mg/L	3.3		0.5	4563880	2.5	2.5	0.5	4563880
Dissolved Zinc (Zn)	mg/L	<0.01		0.01	4563880	<0.01	<0.01	0.01	4563880

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

RCAP - ROUTINE (WATER)

Maxxam ID		CQE367	CQE368		
Sampling Date		2016/06/30	2016/06/30		
COC Number		567024-01-01	567024-01-01		
	UNITS	OW6	DUP	RDL	QC Batch
Calculated Parameters					
Anion Sum	me/L	10.4	9.89	N/A	4562949
Bicarb. Alkalinity (calc. as CaCO ₃)	mg/L	280	270	1.0	4562947
Calculated TDS	mg/L	640	610	1.0	4562952
Carb. Alkalinity (calc. as CaCO ₃)	mg/L	2.0	2.2	1.0	4562947
Cation Sum	me/L	14.0	13.4	N/A	4562949
Hardness (CaCO ₃)	mg/L	470	450	1.0	4562897
Ion Balance (% Difference)	%	14.8	15.2	N/A	4562948
Langelier Index (@ 20C)	N/A	1.07	1.11		4562950
Langelier Index (@ 4C)	N/A	0.825	0.858		4562951
Saturation pH (@ 20C)	N/A	6.80	6.82		4562950
Saturation pH (@ 4C)	N/A	7.05	7.07		4562951
Inorganics					
Total Ammonia-N	mg/L	0.088	<0.050	0.050	4564251
Conductivity	umho/cm	1100	1000	1.0	4563944
Dissolved Organic Carbon	mg/L	4.8	4.9	0.20	4563558
Orthophosphate (P)	mg/L	<0.010	<0.010	0.010	4563634
pH	pH	7.87	7.93		4563946
Dissolved Sulphate (SO ₄)	mg/L	15	14	1.0	4563635
Alkalinity (Total as CaCO ₃)	mg/L	290	280	1.0	4563947
Dissolved Chloride (Cl)	mg/L	160	140	2.0	4563631
Nitrite (N)	mg/L	<0.010	<0.010	0.010	4564993
Nitrate (N)	mg/L	<0.10	<0.10	0.10	4564993
Metals					
Dissolved Calcium (Ca)	mg/L	170	170	0.05	4569777
Dissolved Copper (Cu)	mg/L	<0.02	<0.02	0.02	4569777
Dissolved Iron (Fe)	mg/L	0.65	0.52	0.02	4569777
Dissolved Magnesium (Mg)	mg/L	7.4	7.1	0.05	4569777
Dissolved Manganese (Mn)	mg/L	0.15	0.14	0.01	4569777
Dissolved Potassium (K)	mg/L	1	1	1	4569777
Dissolved Sodium (Na)	mg/L	110	100	0.5	4569777
Dissolved Zinc (Zn)	mg/L	<0.01	<0.01	0.01	4569777
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable					

TEST SUMMARY

Maxxam ID: CQE362
Sample ID: OW1
Matrix: Water

Collected: 2016/06/30
Shipped:
Received: 2016/07/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4563947	N/A	2016/07/04	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4562947	N/A	2016/07/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4563631	N/A	2016/07/05	Deonarine Ramnarine
Conductivity	AT	4563944	N/A	2016/07/04	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4563558	N/A	2016/07/06	Elsamma Alex
Hardness (calculated as CaCO ₃)		4562897	N/A	2016/07/07	Automated Statchk
Dissolved Metals Analysis by ICP	ICP	4563880	2016/07/04	2016/07/06	Azita Fazaeli
Ion Balance (% Difference)	CALC	4562948	N/A	2016/07/07	Automated Statchk
Anion and Cation Sum	CALC	4562949	N/A	2016/07/07	Automated Statchk
Total Ammonia-N	LACH/NH ₄	4564251	N/A	2016/07/07	Charles Opoku-Ware
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	4564993	N/A	2016/07/05	Chandra Nandlal
pH	AT	4563946	N/A	2016/07/04	Surinder Rai
Orthophosphate	KONE	4563634	N/A	2016/07/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4562950	N/A	2016/07/07	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4562951	N/A	2016/07/07	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4563635	N/A	2016/07/05	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	4562952	N/A	2016/07/07	Automated Statchk

Maxxam ID: CQE363
Sample ID: OW2
Matrix: Water

Collected: 2016/06/30
Shipped:
Received: 2016/07/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4563947	N/A	2016/07/04	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4562947	N/A	2016/07/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4563631	N/A	2016/07/05	Deonarine Ramnarine
Conductivity	AT	4563944	N/A	2016/07/04	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4563558	N/A	2016/07/06	Elsamma Alex
Hardness (calculated as CaCO ₃)		4562897	N/A	2016/07/07	Automated Statchk
Dissolved Metals Analysis by ICP	ICP	4563880	2016/07/04	2016/07/06	Azita Fazaeli
Ion Balance (% Difference)	CALC	4562948	N/A	2016/07/07	Automated Statchk
Anion and Cation Sum	CALC	4562949	N/A	2016/07/07	Automated Statchk
Total Ammonia-N	LACH/NH ₄	4564251	N/A	2016/07/07	Charles Opoku-Ware
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	4564993	N/A	2016/07/05	Chandra Nandlal
pH	AT	4563946	N/A	2016/07/04	Surinder Rai
Orthophosphate	KONE	4563634	N/A	2016/07/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4562950	N/A	2016/07/07	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4562951	N/A	2016/07/07	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4563635	N/A	2016/07/05	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	4562952	N/A	2016/07/07	Automated Statchk

TEST SUMMARY

Maxxam ID: CQE364
Sample ID: OW3
Matrix: Water

Collected: 2016/06/30
Shipped:
Received: 2016/07/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4563947	N/A	2016/07/04	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4562947	N/A	2016/07/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4563631	N/A	2016/07/05	Deonarine Ramnarine
Conductivity	AT	4563944	N/A	2016/07/04	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4563558	N/A	2016/07/06	Elsamma Alex
Hardness (calculated as CaCO ₃)		4562897	N/A	2016/07/07	Automated Statchk
Dissolved Metals Analysis by ICP	ICP	4563880	2016/07/04	2016/07/06	Azita Fazaeli
Ion Balance (% Difference)	CALC	4562948	N/A	2016/07/07	Automated Statchk
Anion and Cation Sum	CALC	4562949	N/A	2016/07/07	Automated Statchk
Total Ammonia-N	LACH/NH ₄	4564251	N/A	2016/07/07	Charles Opoku-Ware
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	4564993	N/A	2016/07/05	Chandra Nandlal
pH	AT	4563946	N/A	2016/07/04	Surinder Rai
Orthophosphate	KONE	4563634	N/A	2016/07/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4562950	N/A	2016/07/07	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4562951	N/A	2016/07/07	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4563635	N/A	2016/07/05	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	4562952	N/A	2016/07/07	Automated Statchk

Maxxam ID: CQE365
Sample ID: OW4
Matrix: Water

Collected: 2016/06/30
Shipped:
Received: 2016/07/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4563947	N/A	2016/07/04	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4562947	N/A	2016/07/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4564030	N/A	2016/07/05	Deonarine Ramnarine
Conductivity	AT	4563944	N/A	2016/07/04	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4565985	N/A	2016/07/06	Elsamma Alex
Hardness (calculated as CaCO ₃)		4562897	N/A	2016/07/07	Automated Statchk
Dissolved Metals Analysis by ICP	ICP	4563880	2016/07/04	2016/07/06	Azita Fazaeli
Ion Balance (% Difference)	CALC	4562948	N/A	2016/07/07	Automated Statchk
Anion and Cation Sum	CALC	4562949	N/A	2016/07/07	Automated Statchk
Total Ammonia-N	LACH/NH ₄	4564251	N/A	2016/07/07	Charles Opoku-Ware
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	4563649	N/A	2016/07/05	Chandra Nandlal
pH	AT	4563946	N/A	2016/07/04	Surinder Rai
Orthophosphate	KONE	4564031	N/A	2016/07/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4562950	N/A	2016/07/07	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4562951	N/A	2016/07/07	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4564022	N/A	2016/07/05	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	4562952	N/A	2016/07/07	Automated Statchk

TEST SUMMARY

Maxxam ID: CQE365 Dup
Sample ID: OW4
Matrix: Water

Collected: 2016/06/30
Shipped:
Received: 2016/07/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE	4564030	N/A	2016/07/05	Deonarine Ramnarine
Orthophosphate	KONE	4564031	N/A	2016/07/05	Alina Dobreanu
Sulphate by Automated Colourimetry	KONE	4564022	N/A	2016/07/05	Deonarine Ramnarine

Maxxam ID: CQE366
Sample ID: OW5
Matrix: Water

Collected: 2016/06/30
Shipped:
Received: 2016/07/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4563947	N/A	2016/07/04	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4562947	N/A	2016/07/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4563631	N/A	2016/07/05	Deonarine Ramnarine
Conductivity	AT	4563944	N/A	2016/07/04	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4563558	N/A	2016/07/06	Elsamma Alex
Hardness (calculated as CaCO ₃)		4562897	N/A	2016/07/07	Automated Statchk
Dissolved Metals Analysis by ICP	ICP	4563880	2016/07/04	2016/07/06	Azita Fazaeli
Ion Balance (% Difference)	CALC	4562948	N/A	2016/07/07	Automated Statchk
Anion and Cation Sum	CALC	4562949	N/A	2016/07/07	Automated Statchk
Total Ammonia-N	LACH/NH ₄	4564251	N/A	2016/07/07	Charles Opoku-Ware
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	4564993	N/A	2016/07/05	Chandra Nandlal
pH	AT	4563946	N/A	2016/07/04	Surinder Rai
Orthophosphate	KONE	4563634	N/A	2016/07/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4562950	N/A	2016/07/07	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4562951	N/A	2016/07/07	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4563635	N/A	2016/07/05	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	4562952	N/A	2016/07/07	Automated Statchk

Maxxam ID: CQE366 Dup
Sample ID: OW5
Matrix: Water

Collected: 2016/06/30
Shipped:
Received: 2016/07/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals Analysis by ICP	ICP	4563880	2016/07/04	2016/07/06	Azita Fazaeli

Maxxam ID: CQE367
Sample ID: OW6
Matrix: Water

Collected: 2016/06/30
Shipped:
Received: 2016/07/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4563947	N/A	2016/07/04	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4562947	N/A	2016/07/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4563631	N/A	2016/07/05	Deonarine Ramnarine
Conductivity	AT	4563944	N/A	2016/07/04	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4563558	N/A	2016/07/06	Elsamma Alex
Hardness (calculated as CaCO ₃)		4562897	N/A	2016/07/07	Automated Statchk
Dissolved Metals Analysis by ICP	ICP	4569777	2016/07/08	2016/07/08	Azita Fazaeli

TEST SUMMARY

Maxxam ID: CQE367
Sample ID: OW6
Matrix: Water

Collected: 2016/06/30
Shipped:
Received: 2016/07/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Ion Balance (% Difference)	CALC	4562948	N/A	2016/07/07	Automated Statchk
Anion and Cation Sum	CALC	4562949	N/A	2016/07/07	Automated Statchk
Total Ammonia-N	LACH/NH4	4564251	N/A	2016/07/07	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4564993	N/A	2016/07/05	Chandra Nandlal
pH	AT	4563946	N/A	2016/07/04	Surinder Rai
Orthophosphate	KONE	4563634	N/A	2016/07/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4562950	N/A	2016/07/07	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4562951	N/A	2016/07/07	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4563635	N/A	2016/07/05	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	4562952	N/A	2016/07/07	Automated Statchk

Maxxam ID: CQE368
Sample ID: DUP
Matrix: Water

Collected: 2016/06/30
Shipped:
Received: 2016/07/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4563947	N/A	2016/07/04	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4562947	N/A	2016/07/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	4563631	N/A	2016/07/05	Deonarine Ramnarine
Conductivity	AT	4563944	N/A	2016/07/04	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4563558	N/A	2016/07/06	Elsamma Alex
Hardness (calculated as CaCO3)		4562897	N/A	2016/07/07	Automated Statchk
Dissolved Metals Analysis by ICP	ICP	4569777	2016/07/08	2016/07/08	Azita Fazaeli
Ion Balance (% Difference)	CALC	4562948	N/A	2016/07/07	Automated Statchk
Anion and Cation Sum	CALC	4562949	N/A	2016/07/07	Automated Statchk
Total Ammonia-N	LACH/NH4	4564251	N/A	2016/07/07	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4564993	N/A	2016/07/05	Chandra Nandlal
pH	AT	4563946	N/A	2016/07/04	Surinder Rai
Orthophosphate	KONE	4563634	N/A	2016/07/05	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	4562950	N/A	2016/07/07	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	4562951	N/A	2016/07/07	Automated Statchk
Sulphate by Automated Colourimetry	KONE	4563635	N/A	2016/07/05	Deonarine Ramnarine
Total Dissolved Solids (TDS calc)	CALC	4562952	N/A	2016/07/07	Automated Statchk

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	9.3°C
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Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4563558	EAX	Matrix Spike	Dissolved Organic Carbon	2016/07/06		105	%	80 - 120
4563558	EAX	Spiked Blank	Dissolved Organic Carbon	2016/07/06		100	%	80 - 120
4563558	EAX	Method Blank	Dissolved Organic Carbon	2016/07/06	<0.20		mg/L	
4563558	EAX	RPD	Dissolved Organic Carbon	2016/07/06	0.44		%	20
4563631	DRM	Matrix Spike	Dissolved Chloride (Cl)	2016/07/05		NC	%	80 - 120
4563631	DRM	Spiked Blank	Dissolved Chloride (Cl)	2016/07/05		101	%	80 - 120
4563631	DRM	Method Blank	Dissolved Chloride (Cl)	2016/07/05	<1.0		mg/L	
4563631	DRM	RPD	Dissolved Chloride (Cl)	2016/07/05	2.2		%	20
4563634	ADB	Matrix Spike	Orthophosphate (P)	2016/07/05		98	%	75 - 125
4563634	ADB	Spiked Blank	Orthophosphate (P)	2016/07/05		101	%	80 - 120
4563634	ADB	Method Blank	Orthophosphate (P)	2016/07/05	<0.010		mg/L	
4563634	ADB	RPD	Orthophosphate (P)	2016/07/05	NC		%	25
4563635	DRM	Matrix Spike	Dissolved Sulphate (SO4)	2016/07/05		NC	%	75 - 125
4563635	DRM	Spiked Blank	Dissolved Sulphate (SO4)	2016/07/05		105	%	80 - 120
4563635	DRM	Method Blank	Dissolved Sulphate (SO4)	2016/07/05	<1.0		mg/L	
4563635	DRM	RPD	Dissolved Sulphate (SO4)	2016/07/05	0.29		%	20
4563649	C_N	Matrix Spike	Nitrite (N)	2016/07/05		97	%	80 - 120
			Nitrate (N)	2016/07/05		94	%	80 - 120
4563649	C_N	Spiked Blank	Nitrite (N)	2016/07/05		99	%	80 - 120
			Nitrate (N)	2016/07/05		105	%	80 - 120
4563649	C_N	Method Blank	Nitrite (N)	2016/07/05	<0.010		mg/L	
			Nitrate (N)	2016/07/05	<0.10		mg/L	
4563649	C_N	RPD	Nitrite (N)	2016/07/05	NC		%	25
			Nitrate (N)	2016/07/05	0.46		%	25
4563880	AFZ	Matrix Spike [CQE366-03]	Dissolved Calcium (Ca)	2016/07/06		NC	%	80 - 120
			Dissolved Copper (Cu)	2016/07/06		108	%	80 - 120
			Dissolved Iron (Fe)	2016/07/06		109	%	80 - 120
			Dissolved Magnesium (Mg)	2016/07/06		104	%	80 - 120
			Dissolved Manganese (Mn)	2016/07/06		108	%	80 - 120
			Dissolved Potassium (K)	2016/07/06		108	%	80 - 120
			Dissolved Sodium (Na)	2016/07/06		110	%	80 - 120
			Dissolved Zinc (Zn)	2016/07/06		109	%	80 - 120
4563880	AFZ	Spiked Blank	Dissolved Calcium (Ca)	2016/07/06		106	%	80 - 120
			Dissolved Copper (Cu)	2016/07/06		105	%	80 - 120
			Dissolved Iron (Fe)	2016/07/06		108	%	80 - 120
			Dissolved Magnesium (Mg)	2016/07/06		103	%	80 - 120
			Dissolved Manganese (Mn)	2016/07/06		107	%	80 - 120
			Dissolved Potassium (K)	2016/07/06		105	%	80 - 120
			Dissolved Sodium (Na)	2016/07/06		107	%	80 - 120
			Dissolved Zinc (Zn)	2016/07/06		107	%	80 - 120
4563880	AFZ	Method Blank	Dissolved Calcium (Ca)	2016/07/06	<0.05		mg/L	
			Dissolved Copper (Cu)	2016/07/06	<0.02		mg/L	
			Dissolved Iron (Fe)	2016/07/06	<0.02		mg/L	
			Dissolved Magnesium (Mg)	2016/07/06	<0.05		mg/L	
			Dissolved Manganese (Mn)	2016/07/06	<0.01		mg/L	
			Dissolved Potassium (K)	2016/07/06	<1		mg/L	
			Dissolved Sodium (Na)	2016/07/06	<0.5		mg/L	
			Dissolved Zinc (Zn)	2016/07/06	<0.01		mg/L	
4563880	AFZ	RPD [CQE366-03]	Dissolved Calcium (Ca)	2016/07/06	0.75		%	25
			Dissolved Copper (Cu)	2016/07/06	NC		%	25
			Dissolved Iron (Fe)	2016/07/06	NC		%	25
			Dissolved Magnesium (Mg)	2016/07/06	0.084		%	25
			Dissolved Manganese (Mn)	2016/07/06	NC		%	25
			Dissolved Potassium (K)	2016/07/06	NC		%	25

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Sodium (Na)	2016/07/06	0.12		%	25
			Dissolved Zinc (Zn)	2016/07/06	NC		%	25
4563944	SAU	Spiked Blank	Conductivity	2016/07/04		99	%	85 - 115
4563944	SAU	Method Blank	Conductivity	2016/07/04	<1.0		umho/c	
4563944	SAU	RPD	Conductivity	2016/07/04	0.33		%	25
4563946	SAU	Spiked Blank	pH	2016/07/04		101	%	98 - 103
4563946	SAU	RPD	pH	2016/07/04	0.81		%	N/A
4563947	SAU	Spiked Blank	Alkalinity (Total as CaCO3)	2016/07/04		98	%	85 - 115
4563947	SAU	Method Blank	Alkalinity (Total as CaCO3)	2016/07/04	<1.0		mg/L	
4563947	SAU	RPD	Alkalinity (Total as CaCO3)	2016/07/04	1.3		%	25
4564022	DRM	Matrix Spike [CQE365-01]	Dissolved Sulphate (SO4)	2016/07/05		NC	%	75 - 125
4564022	DRM	Spiked Blank	Dissolved Sulphate (SO4)	2016/07/05		107	%	80 - 120
4564022	DRM	Method Blank	Dissolved Sulphate (SO4)	2016/07/05	<1.0		mg/L	
4564022	DRM	RPD [CQE365-01]	Dissolved Sulphate (SO4)	2016/07/05	0.070		%	20
4564030	DRM	Matrix Spike [CQE365-01]	Dissolved Chloride (Cl)	2016/07/05		103	%	80 - 120
4564030	DRM	Spiked Blank	Dissolved Chloride (Cl)	2016/07/05		101	%	80 - 120
4564030	DRM	Method Blank	Dissolved Chloride (Cl)	2016/07/05	<1.0		mg/L	
4564030	DRM	RPD [CQE365-01]	Dissolved Chloride (Cl)	2016/07/05	0.35		%	20
4564031	ADB	Matrix Spike [CQE365-01]	Orthophosphate (P)	2016/07/05		103	%	75 - 125
4564031	ADB	Spiked Blank	Orthophosphate (P)	2016/07/06		100	%	80 - 120
4564031	ADB	Method Blank	Orthophosphate (P)	2016/07/06	<0.010		mg/L	
4564031	ADB	RPD [CQE365-01]	Orthophosphate (P)	2016/07/05	NC		%	25
4564251	COP	Matrix Spike	Total Ammonia-N	2016/07/07		NC	%	80 - 120
4564251	COP	Spiked Blank	Total Ammonia-N	2016/07/07		100	%	85 - 115
4564251	COP	Method Blank	Total Ammonia-N	2016/07/07	<0.050		mg/L	
4564251	COP	RPD	Total Ammonia-N	2016/07/07	0.30		%	20
4564993	C_N	Matrix Spike	Nitrite (N)	2016/07/05		99	%	80 - 120
			Nitrate (N)	2016/07/05		103	%	80 - 120
4564993	C_N	Spiked Blank	Nitrite (N)	2016/07/05		100	%	80 - 120
			Nitrate (N)	2016/07/05		105	%	80 - 120
4564993	C_N	Method Blank	Nitrite (N)	2016/07/05	<0.010		mg/L	
			Nitrate (N)	2016/07/05	<0.10		mg/L	
4564993	C_N	RPD	Nitrite (N)	2016/07/05	NC		%	25
			Nitrate (N)	2016/07/05	NC		%	25
4565985	EAX	Matrix Spike	Dissolved Organic Carbon	2016/07/06		91	%	80 - 120
4565985	EAX	Spiked Blank	Dissolved Organic Carbon	2016/07/06		103	%	80 - 120
4565985	EAX	Method Blank	Dissolved Organic Carbon	2016/07/06	<0.20		mg/L	
4565985	EAX	RPD	Dissolved Organic Carbon	2016/07/06	NC		%	20
4569777	AFZ	Matrix Spike	Dissolved Calcium (Ca)	2016/07/08		NC	%	80 - 120
			Dissolved Copper (Cu)	2016/07/08		NC	%	80 - 120
			Dissolved Iron (Fe)	2016/07/08		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2016/07/08		NC	%	80 - 120
			Dissolved Manganese (Mn)	2016/07/08		NC	%	80 - 120
			Dissolved Potassium (K)	2016/07/08		NC	%	80 - 120
			Dissolved Sodium (Na)	2016/07/08		NC	%	80 - 120
			Dissolved Zinc (Zn)	2016/07/08		NC	%	80 - 120
4569777	AFZ	Spiked Blank	Dissolved Calcium (Ca)	2016/07/08		96	%	80 - 120
			Dissolved Copper (Cu)	2016/07/08		93	%	80 - 120
			Dissolved Iron (Fe)	2016/07/08		94	%	80 - 120
			Dissolved Magnesium (Mg)	2016/07/08		97	%	80 - 120
			Dissolved Manganese (Mn)	2016/07/08		95	%	80 - 120
			Dissolved Potassium (K)	2016/07/08		97	%	80 - 120
			Dissolved Sodium (Na)	2016/07/08		94	%	80 - 120
			Dissolved Zinc (Zn)	2016/07/08		91	%	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4569777	AFZ	Method Blank	Dissolved Calcium (Ca)	2016/07/08	<0.05		mg/L	
			Dissolved Copper (Cu)	2016/07/08	<0.02		mg/L	
			Dissolved Iron (Fe)	2016/07/08	<0.02		mg/L	
			Dissolved Magnesium (Mg)	2016/07/08	<0.05		mg/L	
			Dissolved Manganese (Mn)	2016/07/08	<0.01		mg/L	
			Dissolved Potassium (K)	2016/07/08	<1		mg/L	
			Dissolved Sodium (Na)	2016/07/08	<0.5		mg/L	
			Dissolved Zinc (Zn)	2016/07/08	<0.01		mg/L	
4569777	AFZ	RPD	Dissolved Sodium (Na)	2016/07/08	0.99		%	25

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere

Cristina Carriere, Scientific Services

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name	#1089 WSP Canada Inc	Company Name	WSP	Quotation #	B62738	Maxxam Job #	Bottle Order #
Attention:	Accounts Payable	Attention:	Tanya Kizovski	P.O. #			
Address:	126 Don Hillock Dr Unit 2	Address:		Project	161-06960-00 /105		
	Aurora ON L4G 0G9			Project Name		COC #	Project Manager:
Tel:	(905) 750-3080 x	Tel:	905-750-3080 x1636	Site #	Farsight Development		
Fax:	(905) 727-0463 x	Fax:		Sampled By:			
Email:	tyables.ontario@wspgroup.com	Email:	tanya.kizovski@wspgroup.com				
						 C#67024-01-01 Ashton Gibson	

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE
SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)		Other Regulations		Special Instructions
☐ Table 1	☒ Res/Park	☐ Medium/Fine	☐ CCME	☐ Sanitary Sewer Bylaw
☒ Table 2	☐ Ind/Comm	☒ Coarse	☐ Reg 558	☐ Storm Sewer Bylaw
☐ Table 3	☐ Agri/Other	☐ For RSC	☐ MISA	Municipality _____
☐ Table _____			☒ PWQO	
			☐ Other _____	
Include Criteria on Certificate of Analysis (Y/N)? ☒				

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

MOE REGULATED DRINKING WATER CHAIN OF CUSTODY FORM MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY							Please provide advance notice for rush projects										
Regulation 153 (2011)			Other Regulations		Special Instructions		Regular (Standard) TAT: (will be applied if Rush TAT is not specified). Standard TAT = 5-7 Working days for most tests. Please note - Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.										
☐ Table 1 ☒ Table 2 ☐ Table 3 ☐ Table _____	☒ Res/Park ☐ Ind/Comm ☐ Agri/Other ☐ _____	☐ Medium/Fine ☒ Coarse ☐ For RSC ☐ _____	☐ CCME ☐ Reg 558 ☐ MISA ☒ PWQO ☐ Other _____	☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw ☐ Municipality _____			Job Specific Rush TAT (if applies to entire submission) Date Required: _____ Time Required: _____ Rush Confirmation Number: _____ (call lab for #)										
Include Criteria on Certificate of Analysis (Y/N)? ☒						Field Filtered (please circle) Metals / Hg / Cr VI	RCAP - Routine	RCAP - Surface Water							# of Bottles	Comments	
Sample Barcode/Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix													
1		OW1	June 30/16	AM	GW	y	X									4	
2		OW2			GW												
3		OW3			GW												
4		OW4			GW												
5		OW5			GW												
6		OW6			GW												
7		DUP			GW												
8					SW												
9					SW												
10																	

02-Jul-16 09:10
Ashton Gibson
B6D6032
ASR ENV-698



* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only				
	10/06/30	15:00		2016/07/02	09:10		Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
								91940	Present	☒	
									Intact	☒	
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL LAT DELAYS.						SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM				White: Maxxam Yellow: Client	

APPENDIX

G

CLIMATE BASED
WATER BUDGET

TABLE G-1

CLIMATIC WATER BUDGET: CLIMATE NORMAL 1981-2010 (KING SMOKE TREE CLIMATE STATION)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY

5426, 5452, 5584 Lakeshore Road, Ballantrae

Town of Whitchurch-Stouffville, Ontario

Thornthwaite (1948)								
Month	Mean Temperature (°C)	Heat Index	Potential Evapo-transpiration (mm)	Daylight Correction Value	Adjusted Potential Evapo-transpiration (mm)	Total Precipitation (mm)	Surplus (mm)	Deficit (mm)
January	-7.4	0.0	0.0	0.7839	0.00	51.7	51.7	0.0
February	-6.1	0.0	0.0	0.8679	0.00	46.0	46.0	0.0
March	-1.5	0.0	0.0	0.9871	0.00	51.2	51.2	0.0
April	6.0	1.3	27.6	1.1200	30.88	64.9	34.0	0.0
May	12.5	4.0	60.4	1.2290	74.29	87.1	12.8	0.0
June	17.7	6.8	87.7	1.2900	113.11	84.8	0.0	28.3
July	20.5	8.5	102.6	1.2581	129.07	86.4	0.0	42.7
August	19.6	7.9	97.8	1.1613	113.55	88.4	0.0	25.2
September	15.3	5.4	75.0	1.0400	78.03	84.2	6.2	0.0
October	8.6	2.3	40.5	0.9194	37.25	72.9	35.6	0.0
November	2.3	0.3	9.7	0.8100	7.82	84.6	76.8	0.0
December	-3.7	0.0	0.0	0.7355	0.00	55.5	55.5	0.0
TOTALS		36.5			584.0	857.7	369.8	96.1

TOTAL WATER SURPLUS 273.7 mm

NOTES:

- 1) Water budget adjusted for latitude and daylight.
- 2) (°C) - Represents calculated mean of daily temperatures for the month.
- 3) Precipitation and Temperature data from the King Smoke Tree Climate Station located at latitude 44°01'00.00" N, longitude 79°31'00.000" W, elevation 352.0 m.
- 4) Total Water Surplus (Thornthwaite, 1948) is calculated as total precipitation minus adjusted potential evapotranspiration.
- 5) Total Moisture Surplus (Thornthwaite and Mather, 1957) is calculated as total precipitation minus actual evapotranspiration.

TABLE G-2
CLIMATIC WATER BUDGET: CLIMATE NORMAL 1981-2010 (KING SMOKE TREE CLIMATE STATION)
SILT LOAM, URBAN LAWN (125 mm HOLDING CAPACITY)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

	Thornthwaite (1948)									Thornthwaite and Mather (1957)						
Month	Mean Temperature (°C)	Heat Index	Potential Evapo-transpiration (mm)	Daylight Correction Value	Adjusted Potential Evapo-transpiration (mm)	Total Precipitation (mm)	Surplus (mm)	Deficit (mm)	TP - PET (mm)	Accumulated Potential Water Loss (mm)	Soil Moisture (mm)	Change in Soil Moisture (mm) (delta S)	Actual Evapo-transpiration (mm)	Moisture Deficit (mm)	Unadjusted Moisture Surplus (mm)	
January	-7.4	0.0	0.0	0.7839	0.00	51.7	51.7	0.0	51.7	0.0	125.0	0.0	0.0	0.0	51.7	
February	-6.1	0.0	0.0	0.8679	0.00	46.0	46.0	0.0	46.0	0.0	125.0	0.0	0.0	0.0	46.0	
March	-1.5	0.0	0.0	0.9871	0.00	51.2	51.2	0.0	51.2	0.0	125.0	0.0	0.0	0.0	51.2	
April	6.0	1.3	27.6	1.1200	30.88	64.9	34.0	0.0	34.0	0.0	125.0	0.0	30.9	0.0	34.0	
May	12.5	4.0	60.4	1.2290	74.29	87.1	12.8	0.0	12.8	0.0	125.0	0.0	74.3	0.0	12.8	
June	17.7	6.8	87.7	1.2900	113.11	84.8	0.0	28.3	-28.3	-28.3	99.0	-26.0	110.8	2.3	0.0	
July	20.5	8.5	102.6	1.2581	129.07	86.4	0.0	42.7	-42.7	-71.0	70.0	-29.0	115.4	13.7	0.0	
August	19.6	7.9	97.8	1.1613	113.55	88.4	0.0	25.2	-25.2	-96.1	57.0	-13.0	101.4	12.2	0.0	
September	15.3	5.4	75.0	1.0400	78.03	84.2	6.2	0.0	6.2	0.0	63.2	6.2	78.0	0.0	0.0	
October	8.6	2.3	40.5	0.9194	37.25	72.9	35.6	0.0	35.6	0.0	98.8	35.6	37.3	0.0	0.0	
November	2.3	0.3	9.7	0.8100	7.82	84.6	76.8	0.0	76.8	0.0	125.0	26.2	7.8	0.0	50.6	
December	-3.7	0.0	0.0	0.7355	0.00	55.5	55.5	0.0	55.5	0.0	125.0	0.0	0.0	0.0	55.5	
TOTALS		36.5			584.0	857.7	369.8	96.1	273.7	-96.1	1263.0	0.0	555.9	28.1	301.8	
TOTAL WATER SURPLUS						273.7	mm		TOTAL MOISTURE SURPLUS						301.8	mm

- NOTES:**
- 1) Water budget adjusted for latitude and daylight.
 - 2) (°C) - Represents calculated mean of daily temperatures for the month.
 - 3) Precipitation and Temperature data from the King Smoke Tree Climate Station located at latitude 44°01'00.00" N, longitude 79°31'00.000" W, elevation 352.0 m.
 - 4) Total Water Surplus (Thornthwaite, 1948) is calculated as total precipitation minus adjusted potential evapotranspiration.
 - 5) Total Moisture Surplus (Thornthwaite and Mather, 1957) is calculated as total precipitation minus actual evapotranspiration.

TABLE G-3
CLIMATIC WATER BUDGET: CLIMATE NORMAL 1981-2010 (KING SMOKE TREE CLIMATE STATION)
SILT LOAM, CULTIVATED (200 mm HOLDING CAPACITY)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

Month	Thornthwaite (1948)								Thornthwaite and Mather (1957)						
	Mean Temperature (°C)	Heat Index	Potential Evapo-transpiration (mm)	Daylight Correction Value	Adjusted Potential Evapo-transpiration (mm)	Total Precipitation (mm)	Surplus (mm)	Deficit (mm)	TP - PET (mm)	Accumulated Potential Water Loss (mm)	Soil Moisture (mm)	Change in Soil Moisture (mm) (delta S)	Actual Evapo-transpiration (mm)	Moisture Deficit (mm)	Unadjusted Moisture Surplus (mm)
January	-7.4	0.0	0.0	0.7839	0.00	51.7	51.7	0.0	51.7	0.0	200.0	0.0	0.0	0.0	51.7
February	-6.1	0.0	0.0	0.8679	0.00	46.0	46.0	0.0	46.0	0.0	200.0	0.0	0.0	0.0	46.0
March	-1.5	0.0	0.0	0.9871	0.00	51.2	51.2	0.0	51.2	0.0	200.0	0.0	0.0	0.0	51.2
April	6.0	1.3	27.6	1.1200	30.88	64.9	34.0	0.0	34.0	0.0	200.0	0.0	30.9	0.0	34.0
May	12.5	4.0	60.4	1.2290	74.29	87.1	12.8	0.0	12.8	0.0	200.0	0.0	74.3	0.0	12.8
June	17.7	6.8	87.7	1.2900	113.11	84.8	0.0	28.3	-28.3	-28.3	173.0	-27.0	111.8	1.3	0.0
July	20.5	8.5	102.6	1.2581	129.07	86.4	0.0	42.7	-42.7	-71.0	140.0	-33.0	119.4	9.7	0.0
August	19.6	7.9	97.8	1.1613	113.55	88.4	0.0	25.2	-25.2	-96.1	123.0	-17.0	105.4	8.2	0.0
September	15.3	5.4	75.0	1.0400	78.03	84.2	6.2	0.0	6.2	0.0	129.2	6.2	78.0	0.0	0.0
October	8.6	2.3	40.5	0.9194	37.25	72.9	35.6	0.0	35.6	0.0	164.8	35.6	37.3	0.0	0.0
November	2.3	0.3	9.7	0.8100	7.82	84.6	76.8	0.0	76.8	0.0	200.0	35.2	7.8	0.0	41.6
December	-3.7	0.0	0.0	0.7355	0.00	55.5	55.5	0.0	55.5	0.0	200.0	0.0	0.0	0.0	55.5
TOTALS		36.5			584.0	857.7	369.8	96.1	273.7	-96.1	2130.0	0.0	564.9	19.1	292.8
TOTAL WATER SURPLUS						273.7	mm		TOTAL MOISTURE SURPLUS						292.8 mm

- NOTES:**
- 1) Water budget adjusted for latitude and daylight.
 - 2) (°C) - Represents calculated mean of daily temperatures for the month.
 - 3) Precipitation and Temperature data from the King Smoke Tree Climate Station located at latitude 44°01'00.00" N, longitude 79°31'00.000" W, elevation 352.0 m.
 - 4) Total Water Surplus (Thornthwaite, 1948) is calculated as total precipitation minus adjusted potential evapotranspiration.
 - 5) Total Moisture Surplus (Thornthwaite and Mather, 1957) is calculated as total precipitation minus actual evapotranspiration.

TABLE G-4
CLIMATIC WATER BUDGET: CLIMATE NORMAL 1981-2010 (KING SMOKE TREE CLIMATE STATION)
SILT LOAM, UNCULTIVATED (250 mm HOLDING CAPACITY)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
 5426, 5452, 5584 Lakeshore Road, Ballantrae
 Town of Whitchurch-Stouffville, Ontario

Month	Thornthwaite (1948)								Thornthwaite and Mather (1957)						
	Mean Temperature (°C)	Heat Index	Potential Evapo-transpiration (mm)	Daylight Correction Value	Adjusted Potential Evapo-transpiration (mm)	Total Precipitation (mm)	Surplus (mm)	Deficit (mm)	TP - PET (mm)	Accumulated Potential Water Loss (mm)	Soil Moisture (mm)	Change in Soil Moisture (mm) (delta S)	Actual Evapo-transpiration (mm)	Moisture Deficit (mm)	Unadjusted Moisture Surplus (mm)
January	-7.4	0.0	0.0	0.7839	0.00	51.7	51.7	0.0	51.7	0.0	250.0	0.0	0.0	0.0	51.7
February	-6.1	0.0	0.0	0.8679	0.00	46.0	46.0	0.0	46.0	0.0	250.0	0.0	0.0	0.0	46.0
March	-1.5	0.0	0.0	0.9871	0.00	51.2	51.2	0.0	51.2	0.0	250.0	0.0	0.0	0.0	51.2
April	6.0	1.3	27.6	1.1200	30.88	64.9	34.0	0.0	34.0	0.0	250.0	0.0	30.9	0.0	34.0
May	12.5	4.0	60.4	1.2290	74.29	87.1	12.8	0.0	12.8	0.0	250.0	0.0	74.3	0.0	12.8
June	17.7	6.8	87.7	1.2900	113.11	84.8	0.0	28.3	-28.3	-28.3	223.0	-27.0	111.8	1.3	0.0
July	20.5	8.5	102.6	1.2581	129.07	86.4	0.0	42.7	-42.7	-71.0	188.0	-35.0	121.4	7.7	0.0
August	19.6	7.9	97.8	1.1613	113.55	88.4	0.0	25.2	-25.2	-96.1	170.0	-18.0	106.4	7.2	0.0
September	15.3	5.4	75.0	1.0400	78.03	84.2	6.2	0.0	6.2	0.0	176.2	6.2	78.0	0.0	0.0
October	8.6	2.3	40.5	0.9194	37.25	72.9	35.6	0.0	35.6	0.0	211.8	35.6	37.3	0.0	0.0
November	2.3	0.3	9.7	0.8100	7.82	84.6	76.8	0.0	76.8	0.0	250.0	38.2	7.8	0.0	38.6
December	-3.7	0.0	0.0	0.7355	0.00	55.5	55.5	0.0	55.5	0.0	250.0	0.0	0.0	0.0	55.5
TOTALS		36.5			584.0	857.7	369.8	96.1	273.7	-96.1	2719.0	0.0	567.9	16.1	289.8
TOTAL WATER SURPLUS						273.7	mm		TOTAL MOISTURE SURPLUS						289.8 mm

- NOTES:**
- 1) Water budget adjusted for latitude and daylight.
 - 2) (°C) - Represents calculated mean of daily temperatures for the month.
 - 3) Precipitation and Temperature data from the King Smoke Tree Climate Station located at latitude 44°01'00.00" N, longitude 79°31'00.000" W, elevation 352.0 m.
 - 4) Total Water Surplus (Thornthwaite, 1948) is calculated as total precipitation minus adjusted potential evapotranspiration.
 - 5) Total Moisture Surplus (Thornthwaite and Mather, 1957) is calculated as total precipitation minus actual evapotranspiration.

TABLE G-5
CLIMATIC WATER BUDGET: CLIMATE NORMAL 1981-2010 (KING SMOKE TREE CLIMATE STATION)
SAND LOAM, WOODLAND (400 mm HOLDING CAPACITY)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

	Thornthwaite (1948)									Thornthwaite and Mather (1957)						
Month	Mean Temperature (°C)	Heat Index	Potential Evapo-transpiration (mm)	Daylight Correction Value	Adjusted Potential Evapo-transpiration (mm)	Total Precipitation (mm)	Surplus (mm)	Deficit (mm)	TP - PET (mm)	Accumulated Potential Water Loss (mm)	Soil Moisture (mm)	Change in Soil Moisture (mm) (delta S)	Actual Evapo-transpiration (mm)	Moisture Deficit (mm)	Unadjusted Moisture Surplus (mm)	
January	-7.4	0.0	0.0	0.7839	0.00	51.7	51.7	0.0	51.7	0.0	400.0	0.0	0.0	0.0	51.7	
February	-6.1	0.0	0.0	0.8679	0.00	46.0	46.0	0.0	46.0	0.0	400.0	0.0	0.0	0.0	46.0	
March	-1.5	0.0	0.0	0.9871	0.00	51.2	51.2	0.0	51.2	0.0	400.0	0.0	0.0	0.0	51.2	
April	6.0	1.3	27.6	1.1200	30.88	64.9	34.0	0.0	34.0	0.0	400.0	0.0	30.9	0.0	34.0	
May	12.5	4.0	60.4	1.2290	74.29	87.1	12.8	0.0	12.8	0.0	400.0	0.0	74.3	0.0	12.8	
June	17.7	6.8	87.7	1.2900	113.11	84.8	0.0	28.3	-28.3	-28.3	373.0	-27.0	111.8	1.3	0.0	
July	20.5	8.5	102.6	1.2581	129.07	86.4	0.0	42.7	-42.7	-71.0	335.0	-38.0	124.4	4.7	0.0	
August	19.6	7.9	97.8	1.1613	113.55	88.4	0.0	25.2	-25.2	-96.1	314.0	-21.0	109.4	4.2	0.0	
September	15.3	5.4	75.0	1.0400	78.03	84.2	6.2	0.0	6.2	0.0	320.2	6.2	78.0	0.0	0.0	
October	8.6	2.3	40.5	0.9194	37.25	72.9	35.6	0.0	35.6	0.0	355.8	35.6	37.3	0.0	0.0	
November	2.3	0.3	9.7	0.8100	7.82	84.6	76.8	0.0	76.8	0.0	400.0	44.2	7.8	0.0	32.6	
December	-3.7	0.0	0.0	0.7355	0.00	55.5	55.5	0.0	55.5	0.0	400.0	0.0	0.0	0.0	55.5	
TOTALS		36.5			584.0	857.7	369.8	96.1	273.7	-96.1	4498.0	0.0	573.9	10.1	283.8	
TOTAL WATER SURPLUS						273.7	mm		TOTAL MOISTURE SURPLUS						283.8	mm

- NOTES:**
- 1) Water budget adjusted for latitude and daylight.
 - 2) (°C) - Represents calculated mean of daily temperatures for the month.
 - 3) Precipitation and Temperature data from the King Smoke Tree Climate Station located at latitude 44°01'00.00" N, longitude 79°31'00.000" W, elevation 352.0 m.
 - 4) Total Water Surplus (Thornthwaite, 1948) is calculated as total precipitation minus adjusted potential evapotranspiration.
 - 5) Total Moisture Surplus (Thornthwaite and Mather, 1957) is calculated as total precipitation minus actual evapotranspiration.

APPENDIX



H

WATER BUDGET
CALCULATIONS –
PRE-DEVELOPMENT

TABLE H-1 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

Subcatchment Designation	On/Off-Site	Outlet	MOE TABLE 2 Components					MOE Infiltration Factor	Adjusted Infiltration Factor	Area (m ²)	Precipitation (mm/a)	Precipitation Total (m ³ /a)	Precipitation Surplus (mm/a)	Evapotranspiration (m ³ /a)	Runon (mm/a)	Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff (m ³ /a)
			Topography	Soil		Cover										(mm/a)	(m ³ /a)	(mm/a)	(mm/a)	(m ³ /a)	(mm/a)	
A-9	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	3512.6	857.7	3012.7	283.8	2015.8	0.0	283.8	996.9	847.4	241.2	149.5	42.6	996.9
A-10	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	1.6	857.7	1.4	283.8	0.9	0.0	283.8	0.5	0.4	241.2	0.1	42.6	0.5
A-24	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Building	0	0.65	0.00	9.8	857.7	8.4	771.9	0.8	0.0	771.9	7.6	0.0	0.0	7.6	771.9	7.6
A-25	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Building	0	0.65	0.00	59.5	857.7	51.1	771.9	5.1	0.0	771.9	46.0	0.0	0.0	46.0	771.9	46.0
A-26	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Building	0	0.65	0.00	31.2	857.7	26.7	771.9	2.7	0.0	771.9	24.1	0.0	0.0	24.1	771.9	24.1
A-27	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Building	0	0.65	0.00	1.4	857.7	1.2	771.9	0.1	0.0	771.9	1.1	0.0	0.0	1.1	771.9	1.1
A-28	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Building	0	0.65	0.00	12.6	857.7	10.8	771.9	1.1	0.0	771.9	9.7	0.0	0.0	9.7	771.9	9.7
A-29	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Building	0	0.65	0.00	109.1	857.7	93.6	771.9	9.4	0.0	771.9	84.2	0.0	0.0	84.2	771.9	84.2
A-30	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Building	0	0.65	0.00	124.0	857.7	106.4	771.9	10.6	0.0	771.9	95.7	0.0	0.0	95.7	771.9	95.7
A-31	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Building	0	0.65	0.00	430.0	857.7	368.8	771.9	36.9	0.0	771.9	332.0	0.0	0.0	332.0	771.9	332.0
A-32	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Building	0	0.55	0.00	228.6	857.7	196.1	771.9	19.6	0.0	771.9	176.5	0.0	0.0	176.5	771.9	176.5
A-33	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Building	0	0.55	0.00	340.3	857.7	291.9	771.9	29.2	0.0	771.9	262.7	0.0	0.0	262.7	771.9	262.7
A-34	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Gravel	0.05	0.60	0.60	189.8	857.7	162.8	301.8	105.5	0.0	301.8	57.3	34.4	181.1	22.9	120.7	57.3
A-35	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Patio	0	0.55	0.00	172.5	857.7	148.0	771.9	14.8	0.0	771.9	133.2	0.0	0.0	133.2	771.9	133.2
A-36	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Wooded Area	0.2	0.75	0.75	2427.6	857.7	2082.1	283.8	1393.1	0.0	283.8	689.0	516.7	212.9	172.2	71.0	689.0
A-38	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	313.8	857.7	269.1	301.8	174.4	0.0	301.8	94.7	66.3	211.3	28.4	90.5	94.7
A-39	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	15.6	857.7	13.4	301.8	8.7	0.0	301.8	4.7	3.3	211.3	1.4	90.5	4.7
A-40	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	210.0	857.7	180.1	301.8	116.7	0.0	301.8	63.4	44.4	211.3	19.0	90.5	63.4
A-41	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	274.9	857.7	235.8	301.8	152.8	0.0	301.8	83.0	58.1	211.3	24.9	90.5	83.0
A-42	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	44.8	857.7	38.4	301.8	24.9	0.0	301.8	13.5	9.5	211.3	4.1	90.5	13.5
A-43	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	36.1	857.7	31.0	301.8	20.1	0.0	301.8	10.9	7.6	211.3	3.3	90.5	10.9
A-44	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	298.4	857.7	256.0	301.8	165.9	0.0	301.8	90.1	63.0	211.3	27.0	90.5	90.1
A-45	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	298.4	857.7	256.0	301.8	165.9	0.0	301.8	90.1	63.0	211.3	27.0	90.5	90.1
A-46	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	298.4	857.7	256.0	301.8	165.9	0.0	301.8	90.1	63.0	211.3	27.0	90.5	90.1
A-47	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	284.2	857.7	243.8	301.8	158.0	0.0	301.8	85.8	60.0	211.3	25.7	90.5	85.8
A-48	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	154.9	857.7	132.9	301.8	86.1	0.0	301.8	46.8	32.7	211.3	14.0	90.5	46.8
A-49	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	4.6	857.7	4.0	301.8	2.6	0.0	301.8	1.4	1.0	211.3	0.4	90.5	1.4
A-50	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	223.3	857.7	191.5	301.8	124.1	0.0	301.8	67.4	47.2	211.3	20.2	90.5	67.4
A-51	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	266.1	857.7	228.2	301.8	147.9	0.0	301.8	80.3	56.2	211.3	24.1	90.5	80.3
A-52	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	10.9	857.7	9.3	301.8	6.0	0.0	301.8	3.3	2.3	211.3	1.0	90.5	3.3
A-53	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	10.9	857.7	9.3	301.8	6.0	0.0	301.8	3.3	2.3	211.3	1.0	90.5	3.3
A-54	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	10.9	857.7	9.3	301.8	6.0	0.0	301.8	3.3	2.3	211.3	1.0	90.5	3.3
A-55	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	1.7	857.7	1.4	301.8	0.9	0.0	301.8	0.5	0.4	211.3	0.2	90.5	0.5
A-56	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	10.9	857.7	9.3	301.8	6.1	0.0	301.8	3.3	2.3	211.3	1.0	90.5	3.3
A-57	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	10.9	857.7	9.3	301.8	6.1	0.0	301.8	3.3	2.3	211.3	1.0	90.5	3.3
A-58	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	10.9	857.7	9.3	301.8	6.1	0.0	301.8	3.3	2.3	211.3	1.0	90.5	3.3
A-59	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	10.9	857.7	9.3	301.8	6.1	0.							

TABLE H-1 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

Subcatchment Designation	On/Off-Site	Outlet	MOE TABLE 2 Components					MOE Infiltration Factor	Adjusted Infiltration Factor	Area (m ²)	Precipitation (mm/a)	Precipitation Total (m ³ /a)	Precipitation Surplus (mm/a)	Evapotranspiration (m ³ /a)	Runon (mm/a)	Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff (m ³ /a)
			Topography	Soil		Cover	(mm/a)									(m ³ /a)	(mm/a)	(m ³ /a)	(mm/a)	(m ³ /a)	(mm/a)	
A-92	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	60.4	857.7	51.8	301.8	33.6	0.0	301.8	18.2	12.8	211.3	5.5	90.5	18.2
A-93	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	251.6	857.7	215.8	301.8	139.9	0.0	301.8	75.9	53.2	211.3	22.8	90.5	75.9
A-94	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	351.3	857.7	301.3	301.8	195.3	0.0	301.8	106.0	74.2	211.3	31.8	90.5	106.0
A-95	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	143.5	857.7	123.1	301.8	79.8	0.0	301.8	43.3	30.3	211.3	13.0	90.5	43.3
A-96	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	75.1	857.7	64.4	301.8	41.8	0.0	301.8	22.7	15.9	211.3	6.8	90.5	22.7
A-97	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	63.5	857.7	54.5	301.8	35.3	0.0	301.8	19.2	13.4	211.3	5.7	90.5	19.2
A-98	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	211.3	857.7	181.3	301.8	117.5	0.0	301.8	63.8	44.7	211.3	19.1	90.5	63.8
A-113	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	2203.3	857.7	1889.8	289.8	1251.2	108.3	398.2	877.3	701.8	318.5	175.5	79.6	877.3
A-114	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	262.3	857.7	225.0	289.8	149.0	0.0	289.8	76.0	60.8	231.9	15.2	58.0	76.0
A-115	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	69.2	231.9	17.3	58.0	86.5
A-116	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	69.2	231.9	17.3	58.0	86.5
A-117	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	69.2	231.9	17.3	58.0	86.5
A-118	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	69.2	231.9	17.3	58.0	86.5
A-119	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	69.2	231.9	17.3	58.0	86.5
A-120	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	69.2	231.9	17.3	58.0	86.5
A-121	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	69.2	231.9	17.3	58.0	86.5
A-122	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	69.2	231.9	17.3	58.0	86.5
A-123	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	69.2	231.9	17.3	58.0	86.5
A-124	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	69.2	231.9	17.3	58.0	86.5
A-125	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	69.2	231.9	17.3	58.0	86.5
A-126	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	69.2	231.9	17.3	58.0	86.5
A-127	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	69.2	231.9	17.3	58.0	86.5
A-128	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	237.2	857.7	203.5	289.8	134.7	0.0	289.8	68.8	55.0	231.9	13.8	58.0	68.8
A-129	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	155.1	857.7	133.1	289.8	88.1	0.0	289.8	45.0	36.0	231.9	9.0	58.0	45.0
A-130	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	168.2	857.7	144.3	289.8	95.5	0.0	289.8	48.8	39.0	231.9	9.8	58.0	48.8
A-131	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	32.4	857.7	27.8	289.8	18.4	0.0	289.8	9.4	7.5	231.9	1.9	58.0	9.4
A-132	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	149.3	857.7	128.1	289.8	84.8	0.0	289.8	43.3	34.6	231.9	8.7	58.0	43.3
A-133	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	157.8	857.7	135.4	289.8	89.6	0.0	289.8	45.7	36.6	231.9	9.1	58.0	45.7
A-134	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	153.7	857.7	131.9	289.8	87.3	0.0	289.8	44.6	35.6	231.9	8.9	58.0	44.6
A-135	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	238.2	857.7	204.3	289.8	135.3	0.0	289.8	69.0	55.2	231.9	13.8	58.0	69.0
A-136	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	9.2	857.7	7.9	289.8	5.2	0.0	289.8	2.7	2.1	231.9	0.5	58.0	2.7
A-137	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.2	2.5	231.9	0.6	58.0	3.2
A-138	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.2	2.5	231.9	0.6	58.0	3.2
A-139	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.2	2.5	231.9	0.6	58.0	3.2
A-140	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.2	2.5	231.9	0.6	58.0	3.2
A-141	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.2	2.5	231.9	0.6	58.0	3.2
A-142	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.															

TABLE H-1 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

Subcatchment Designation	On/Off-Site	Outlet	MOE TABLE 2 Components					MOE Infiltration Factor	Adjusted Infiltration Factor	Area (m ²)	Precipitation (mm/a)	Precipitation Total (m ³ /a)	Precipitation Surplus (mm/a)	Evapotranspiration (m ³ /a)	Runon (mm/a)	Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff (m ³ /a)
			Topography	Soil		Cover										(mm/a)	(m ³ /a)	(mm/a)	(m ³ /a)	(mm/a)	(m ³ /a)	
A-175	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	41.5	857.7	35.6	289.8	23.6	0.0	289.8	12.0	9.6	231.9	2.4	58.0	12.0
A-176	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	58.4	857.7	50.1	289.8	33.2	0.0	289.8	16.9	13.6	231.9	3.4	58.0	16.9
A-177	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	1365.8	857.7	1171.4	289.8	775.6	0.0	289.8	395.8	316.7	231.9	79.2	58.0	395.8
A-178	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	127.4	857.7	109.3	289.8	72.3	0.0	289.8	36.9	29.5	231.9	7.4	58.0	36.9
A-179	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	50.3	857.7	43.1	289.8	28.6	0.0	289.8	14.6	11.7	231.9	2.9	58.0	14.6
A-180	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	274.9	857.7	235.8	289.8	156.1	0.0	289.8	79.7	63.7	231.9	15.9	58.0	79.7
A-181	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	274.9	857.7	235.8	289.8	156.1	0.0	289.8	79.7	63.7	231.9	15.9	58.0	79.7
A-182	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	268.9	857.7	230.6	289.8	152.7	0.0	289.8	77.9	62.3	231.9	15.6	58.0	77.9
A-183	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	270.3	857.7	231.9	289.8	153.5	0.0	289.8	78.4	62.7	231.9	15.7	58.0	78.4
A-184	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	227.0	857.7	194.7	289.8	128.9	0.0	289.8	65.8	52.6	231.9	13.2	58.0	65.8
A-185	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	274.9	857.7	235.8	289.8	156.1	0.0	289.8	79.7	63.7	231.9	15.9	58.0	79.7
A-186	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	274.9	857.7	235.8	289.8	156.1	0.0	289.8	79.7	63.7	231.9	15.9	58.0	79.7
A-187	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	118.3	857.7	101.5	289.8	67.2	0.0	289.8	34.3	27.4	231.9	6.9	58.0	34.3
A-188	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	208.4	857.7	178.8	289.8	118.4	0.0	289.8	60.4	48.3	231.9	12.1	58.0	60.4
A-189	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	50.8	857.7	43.6	289.8	28.8	0.0	289.8	14.7	11.8	231.9	2.9	58.0	14.7
A-190	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	6.9	857.7	5.9	289.8	3.9	0.0	289.8	2.0	1.6	231.9	0.4	58.0	2.0
A-191	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	14.6	857.7	12.5	289.8	8.3	0.0	289.8	4.2	3.4	231.9	0.8	58.0	4.2
A-192	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	253.4	857.7	217.4	289.8	143.9	0.0	289.8	73.5	58.8	231.9	14.7	58.0	73.5
A-193	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	21.9	857.7	18.8	289.8	12.4	0.0	289.8	6.3	5.1	231.9	1.3	58.0	6.3
A-194	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	124.4	857.7	106.7	289.8	70.7	0.0	289.8	36.1	28.9	231.9	7.2	58.0	36.1
A-195	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	9.9	857.7	8.5	289.8	5.6	0.0	289.8	2.9	2.3	231.9	0.6	58.0	2.9
A-196	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.1	2.5	231.9	0.6	58.0	3.1
A-197	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.1	2.5	231.9	0.6	58.0	3.1
A-198	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.1	2.5	231.9	0.6	58.0	3.1
A-199	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.1	2.5	231.9	0.6	58.0	3.1
A-200	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.1	2.5	231.9	0.6	58.0	3.1
A-201	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.1	2.5	231.9	0.6	58.0	3.1
A-202	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.1	2.5	231.9	0.6	58.0	3.1
A-203	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.1	2.5	231.9	0.6	58.0	3.1
A-204	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.1	2.5	231.9	0.6	58.0	3.1
A-205	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.1	2.5	231.9	0.6	58.0	3.1
A-206	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.1	2.5	231.9	0.6	58.0	3.1
A-207	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.2	2.5	231.9	0.6	58.0	3.2
A-208	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.2	2.5	231.9	0.6	58.0	3.2
A-209	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	53.5	857.7	45.9	289.8	30.4	0.0	289.8	15.5	12.4	231.9	3.1	58.0	15.5
A-210	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	77.5	857.7	66.5	289.8	44.0	0.0	289.8	22.5	18.0	231.9	4.5	58.0	22.5
A-211	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	52.0	857.7	44.6	289.8	29.6	0.0	289.8</						

TABLE H-1 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

Subcatchment Designation	On/Off-Site	Outlet	MOE TABLE 2 Components					MOE Infiltration Factor	Adjusted Infiltration Factor	Area (m ²)	Precipitation (mm/a)	Precipitation Total (m ³ /a)	Precipitation Surplus (mm/a)	Evapotranspiration (m ³ /a)	Runon (mm/a)	Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff (m ³ /a)
			Topography	Soil		Cover										(mm/a)	(m ³ /a)	(mm/a)	(mm/a)	(m ³ /a)	(mm/a)	
A-244	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	25.9	857.7	22.3	289.8	14.7	0.0	289.8	7.5	6.0	231.9	1.5	58.0	7.5
A-245	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	1.0	857.7	0.9	289.8	0.6	0.0	289.8	0.3	0.2	231.9	0.1	58.0	0.3
A-246	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	14.7	857.7	12.6	289.8	8.3	0.0	289.8	4.3	3.4	231.9	0.9	58.0	4.3
A-247	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	4.3	857.7	3.7	289.8	2.4	0.0	289.8	1.2	1.0	231.9	0.2	58.0	1.2
A-248	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	74.7	857.7	64.1	289.8	42.4	0.0	289.8	21.6	17.3	231.9	4.3	58.0	21.6
A-249	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	56.7	857.7	48.7	289.8	32.2	0.0	289.8	16.4	13.2	231.9	3.3	58.0	16.4
A-250	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	97.4	857.7	83.6	289.8	55.3	0.0	289.8	28.2	22.6	231.9	5.6	58.0	28.2
A-251	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	59.5	857.7	51.1	289.8	33.8	0.0	289.8	17.3	13.8	231.9	3.5	58.0	17.3
A-252	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	58.4	857.7	50.1	289.8	33.2	0.0	289.8	16.9	13.5	231.9	3.4	58.0	16.9
A-253	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	62.0	857.7	53.2	289.8	35.2	0.0	289.8	18.0	14.4	231.9	3.6	58.0	18.0
A-254	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	138.6	857.7	118.9	289.8	78.7	0.0	289.8	40.2	32.1	231.9	8.0	58.0	40.2
A-255	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	130.2	857.7	111.7	289.8	73.9	0.0	289.8	37.7	30.2	231.9	7.5	58.0	37.7
A-256	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	100.8	857.7	86.5	289.8	57.3	0.0	289.8	29.2	23.4	231.9	5.8	58.0	29.2
A-257	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	60.3	857.7	51.7	289.8	34.2	0.0	289.8	17.5	14.0	231.9	3.5	58.0	17.5
A-258	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	140.6	857.7	120.6	289.8	79.9	0.0	289.8	40.8	32.6	231.9	8.2	58.0	40.8
A-259	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	144.7	857.7	124.1	289.8	82.2	0.0	289.8	41.9	33.5	231.9	8.4	58.0	41.9
A-262	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	1074.5	857.7	921.6	283.8	616.6	0.0	283.8	305.0	259.2	241.2	45.7	42.6	305.0
A-263	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	1329.6	857.7	1140.4	283.8	763.0	0.0	283.8	377.4	320.8	241.2	56.6	42.6	377.4
C-296	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	1005.0	857.7	862.0	289.8	570.7	0.0	289.8	291.3	233.0	231.9	58.3	58.0	291.3
C-297	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	2102.2	857.7	1803.1	289.8	1193.8	0.0	289.8	609.3	487.4	231.9	121.9	58.0	609.3
A-298	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	12.9	857.7	11.1	283.8	7.4	0.0	283.8	3.7	3.1	241.2	0.6	42.6	3.7
A-299	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	217.5	857.7	186.5	283.8	124.8	0.0	283.8	61.7	52.5	241.2	9.3	42.6	61.7
A-300	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	61.2	857.7	52.5	283.8	35.1	0.0	283.8	17.4	14.8	241.2	2.6	42.6	17.4
A-301	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	11.9	857.7	10.2	283.8	6.8	0.0	283.8	3.4	2.9	241.2	0.5	42.6	3.4
A-302	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	52.3	857.7	44.9	283.8	30.0	0.0	283.8	14.8	12.6	241.2	2.2	42.6	14.8
A-303	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	5.6	857.7	4.8	283.8	3.2	0.0	283.8	1.6	1.3	241.2	0.2	42.6	1.6
A-304	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	2.4	857.7	2.1	283.8	1.4	0.0	283.8	0.7	0.6	241.2	0.1	42.6	0.7
A-305	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	47.9	857.7	41.1	283.8	27.5	0.0	283.8	13.6	11.6	241.2	2.0	42.6	13.6
A-306	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	208.0	857.7	178.4	283.8	119.4	0.0	283.8	59.0	50.2	241.2	8.9	42.6	59.0
A-307	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	174.0	857.7	149.2	283.8	99.8	0.0	283.8	49.4	42.0	241.2	7.4	42.6	49.4
A-308	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	11.3	857.7	9.7	283.8	6.5	0.0	283.8	3.2	2.7	241.2	0.5	42.6	3.2
A-309	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	91.1	857.7	78.2	283.8	52.3	0.0	283.8	25.9	22.0	241.2	3.9	42.6	25.9
A-310	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	45.8	857.7	39.3	283.8	26.3	0.0	283.8	13.0	11.1	241.2	2.0	42.6	13.0
A-311	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	46.2	857.7	39.6	283.8	26.5	0.0	283.8	13.1	11.1	241.2	2.0	42.6	13.1
A-312	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	22.8	857.7	19.6	283.8	13.1	0.0	283.8	6.5	5.5	241.2	1.0	42.6	6.5
A-313	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	27.4	857.7	23.5	283.8	15.7	0.0	283.8	7.8	6.6	241.2	1.2	42.6	7.8
A-314	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	24.0	857.7	20.6	283.8	13.8	0.							

TABLE H-1 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
 5426, 5452, 5584 Lakeshore Road, Ballantrae
 Town of Whitchurch-Stouffville, Ontario

Subcatchment Designation	On/Off-Site	Outlet	MOE TABLE 2 Components				MOE Infiltration Factor	Adjusted Infiltration Factor	Area (m²)	Precipitation (mm/a)	Precipitation Total (m³/a)	Precipitation Surplus (mm/a)	Evapotranspiration (m³/a)	Runon (mm/a)	Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff (m³/a)	
			Topography	Soil		Cover									(mm/a)	(m³/a)	(mm/a)	(mm/a)	(m³/a)	(m³/a)		(m³/a)
A-348	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-349	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-350	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-351	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-352	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-353	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-354	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-355	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-356	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-357	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-358	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-359	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-360	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-361	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-362	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-363	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-364	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-365	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	72.7	857.7	62.4	292.8	41.1	0.0	292.8	21.3	16.0	219.6	5.3	73.2	21.3
A-366	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-367	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-368	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-369	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-370	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-371	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-372	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-373	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-374	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-375	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-376	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-377	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-378	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-379	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-380	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-381	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-382	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-383	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-384	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-385	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-386	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-387	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-388	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-389	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-390	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	42.5	857.7	36.4	292.8	24.0	0.0	292.8	12.4	9.3	219.6	3.1	73.2	12.4
A-391	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	49.5	857.7	42.5	292.8	28.0	0.0	292.8	14.5	10.9	219.6	3.6	73.2	14.5
A-392	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	43.0	857.7	36.9	292.8	24.3	0.0	292.8	12.6	9.5	219.6	3.2	73.2	12.6
A-393	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	43.3	857.7	37.1	292.8	24.5	0.0	292.8	12.7	9.5	219.6	3.2	73.2	12.7
A-394	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	50.7	857.7	43.5	292.8	28.7	0.0	292.8	14.9	11.1	219.6	3.7	73.2	14.9
A-395	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	51.2	857.7	43.9	292.8	28.9	0.0	292.8	15.0	11.2	219.6	3.7	73.2	15.0
A-396	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	43.3	857.7	37.2	292.8	24.5	0.0	292.8	12.7	9.5	219.6	3.2	73.2	12.7
A-397	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	43.2	857.7	37.0	292.8	24.4	0.0	292.8	12.6	9.5	219.6	3.2	73.2	12.6
A-398	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	51.8	857.7	44.4	292.8	29.2	0.0	292.8	15.2	11.4	219.6	3.8	73.2	15.2
A-399	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	42.4	857.7	36.4	292.8	24.0	0.0	292.8	12.4	9.3	219.6	3.1	73.2	12.4
A-400	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	51.0	857.7	43.7	292.8	28.8	0.0	292.8	14.9	11.2	219.6	3.7	73.2	14.9
A-401	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	49.3	857.7	42.3	292.8	27.9	0.0	292.8	14.4	10.8	219.6	3.6	73.2	14.4
A-402	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	44.2	857.7	37.9	292.8	25.0	0.0	292.8	12.9	9.7	219.6	3.2	73.2	12.9
A-403	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	49.9	857.7	42.8	292.8	28.2	0.0	292.8	14.6	11.0	219.6	3.7	73.2	14.6
A-404	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	51.6	857.7	44.3	292.8	29.2	0.0	292.8	15.1	11.3	219.6	3.8	73.2	15.1
A-405	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam</																		

TABLE H-1 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
 5426, 5452, 5584 Lakeshore Road, Ballantrae
 Town of Whitchurch-Stouffville, Ontario

Subcatchment Designation	On/Off-Site	Outlet	MOE TABLE 2 Components				MOE Infiltration Factor	Adjusted Infiltration Factor	Area (m²)	Precipitation (mm/a)	Precipitation Total (m³/a)	Precipitation Surplus (mm/a)	Evapotranspiration (m³/a)	Runon (mm/a)	Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff (m³/a)	
			Topography	Soil		Cover									(mm/a)	(m³/a)	(m³/a)	(m³/a)	(m³/a)	(m³/a)		(m³/a)
A-417	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-418	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-419	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-420	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-421	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-422	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-423	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-424	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-425	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-426	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-427	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-428	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-429	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-430	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-431	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-432	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-433	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-434	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-435	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-436	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-437	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-438	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-439	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-440	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-441	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-442	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-443	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-444	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-445	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-446	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-447	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-448	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-449	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-450	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-451	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-452	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-453	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-454	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-455	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-456	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-457	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-458	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-459	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-460	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-461	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-462	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-463	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-464	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-465	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-466	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-467	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-468	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-469	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-470	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-471	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	4.4	857.7	3.8	292.8	2.5	0.0	292.8	1.3	1.0	219.6	0.3	73.2	1.3
A-472	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-473	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-474	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8						

TABLE H-1 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

Subcatchment Designation	On/Off-Site	Outlet	MOE TABLE 2 Components				MOE Infiltration Factor	Adjusted Infiltration Factor	Area (m ²)	Precipitation (mm/a)	Precipitation Total (m ³ /a)	Precipitation Surplus (mm/a)	Evapotranspiration (m ³ /a)	Runon (mm/a)	Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff (m ³ /a)	
			Topography	Soil		Cover									(mm/a)	(m ³ /a)	(mm/a)	(m ³ /a)	(mm/a)	(m ³ /a)		(mm/a)
A-486	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-487	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-488	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-489	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-490	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-491	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-492	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-493	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.4	219.6	0.8	73.2	3.2
A-494	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	48.7	857.7	41.8	292.8	27.5	0.0	292.8	14.3	10.7	219.6	3.6	73.2	14.3
A-495	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	48.3	857.7	41.4	292.8	27.3	0.0	292.8	14.1	10.6	219.6	3.5	73.2	14.1
A-496	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	49.7	857.7	42.7	292.8	28.1	0.0	292.8	14.6	10.9	219.6	3.6	73.2	14.6
A-497	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	49.3	857.7	42.3	292.8	27.9	0.0	292.8	14.4	10.8	219.6	3.6	73.2	14.4
A-498	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	47.9	857.7	41.1	292.8	27.1	0.0	292.8	14.0	10.5	219.6	3.5	73.2	14.0
A-499	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	45.3	857.7	38.8	292.8	25.6	0.0	292.8	13.3	9.9	219.6	3.3	73.2	13.3
A-500	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	49.5	857.7	42.4	292.8	27.9	0.0	292.8	14.5	10.9	219.6	3.6	73.2	14.5
A-501	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	51.2	857.7	43.9	292.8	28.9	0.0	292.8	15.0	11.2	219.6	3.7	73.2	15.0
A-502	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	44.0	857.7	37.7	292.8	24.8	0.0	292.8	12.9	9.7	219.6	3.2	73.2	12.9
A-503	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	49.8	857.7	42.7	292.8	28.1	0.0	292.8	14.6	10.9	219.6	3.6	73.2	14.6
A-504	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	49.0	857.7	42.0	292.8	27.7	0.0	292.8	14.4	10.8	219.6	3.6	73.2	14.4
A-505	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	41.5	857.7	35.6	292.8	23.4	0.0	292.8	12.1	9.1	219.6	3.0	73.2	12.1
A-506	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	42.5	857.7	36.5	292.8	24.0	0.0	292.8	12.5	9.3	219.6	3.1	73.2	12.5
A-507	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	49.6	857.7	42.6	292.8	28.0	0.0	292.8	14.5	10.9	219.6	3.6	73.2	14.5
A-508	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	7.0	857.7	6.0	292.8	3.9	0.0	292.8	2.0	1.5	219.6	0.5	73.2	2.0
A-509	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	53.4	857.7	45.8	292.8	30.1	0.0	292.8	15.6	11.7	219.6	3.9	73.2	15.6
A-510	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	47.9	857.7	41.1	292.8	27.1	0.0	292.8	14.0	10.5	219.6	3.5	73.2	14.0
A-511	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	45.1	857.7	38.7	292.8	25.5	0.0	292.8	13.2	9.9	219.6	3.3	73.2	13.2
A-512	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	44.2	857.7	37.9	292.8	25.0	0.0	292.8	12.9	9.7	219.6	3.2	73.2	12.9
A-513	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	50.3	857.7	43.1	292.8	28.4	0.0	292.8	14.7	11.0	219.6	3.7	73.2	14.7
A-514	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	50.7	857.7	43.5	292.8	28.6	0.0	292.8	14.8	11.1	219.6	3.7	73.2	14.8
A-515	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	44.6	857.7	38.3	292.8	25.2	0.0	292.8	13.1	9.8	219.6	3.3	73.2	13.1
A-516	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	43.6	857.7	37.4	292.8	24.7	0.0	292.8	12.8	9.6	219.6	3.2	73.2	12.8
A-517	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	50.0	857.7	42.9	292.8	28.3	0.0	292.8	14.6	11.0	219.6	3.7	73.2	14.6
A-518	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	50.9	857.7	43.7	292.8	28.8	0.0	292.8	14.9	11.2	219.6	3.7	73.2	14.9
A-519	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	51.5	857.7	44.2	292.8	29.1	0.0	292.8	15.1	11.3	219.6	3.8	73.2	15.1
A-520	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	51.4	857.7	44.1	292.8	29.0	0.0	292.8	15.1	11.3	219.6	3.8	73.2	15.1
A-521	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	50.7	857.7	43.5	292.8	28.6	0.0	292.8	14.8	11.1	219.6	3.7	73.2	14.8
A-522	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	53.4	857.7	45.8	292.8	30.2	0.0	292.8	15.6	11.7	219.6	3.9	73.2	15.6
A-523	On Site	Off-Site to SE Corner - Via Creek	0.25</																			

TABLE H-1 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

Subcatchment Designation	On/Off-Site	Outlet	MOE TABLE 2 Components				MOE Infiltration Factor	Adjusted Infiltration Factor	Area (m ²)	Precipitation (mm/a)	Precipitation Total (m ³ /a)	Precipitation Surplus (mm/a)	Evapotranspiration (m ³ /a)	Runon (mm/a)	Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff (m ³ /a)	
			Topography	Soil		Cover									(mm/a)	(m ³ /a)	(mm/a)	(mm/a)	(m ³ /a)	(mm/a)		(m ³ /a)
A-555	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-556	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-557	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-558	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-559	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-560	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-561	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-562	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-563	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-564	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-565	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-566	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-567	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-568	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-569	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-570	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-571	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-572	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	298.4	857.7	256.0	292.8	168.6	0.0	292.8	87.4	65.5	219.6	21.8	73.2	87.4
A-573	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	6.5	857.7	5.5	292.8	3.6	0.0	292.8	1.9	1.4	219.6	0.5	73.2	1.9
A-574	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	3.6	857.7	3.1	292.8	2.0	0.0	292.8	1.0	0.8	219.6	0.3	73.2	1.0
A-575	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	4.5	857.7	3.8	292.8	2.5	0.0	292.8	1.3	1.0	219.6	0.3	73.2	1.3
A-576	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	6.7	857.7	5.8	292.8	3.8	0.0	292.8	2.0	1.5	219.6	0.5	73.2	2.0
A-577	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	1.2	857.7	1.1	292.8	0.7	0.0	292.8	0.4	0.3	219.6	0.1	73.2	0.4
A-578	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	7.9	857.7	6.8	292.8	4.4	0.0	292.8	2.3	1.7	219.6	0.6	73.2	2.3
A-579	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	10.3	857.7	8.8	292.8	5.8	0.0	292.8	3.0	2.3	219.6	0.8	73.2	3.0
A-580	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	27.8	857.7	23.8	292.8	15.7	0.0	292.8	8.1	6.1	219.6	2.0	73.2	8.1
A-581	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	161.5	857.7	138.5	292.8	91.2	0.0	292.8	47.3	35.5	219.6	11.8	73.2	47.3
A-582	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	99.3	857.7	85.1	292.8	56.1	0.0	292.8	29.1	21.8	219.6	7.3	73.2	29.1
A-583	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	114.1	857.7	97.9	292.8	64.5	0.0	292.8	33.4	25.1	219.6	8.4	73.2	33.4
A-584	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	68.6	857.7	58.8	292.8	38.7	0.0	292.8	20.1	15.1	219.6	5.0	73.2	20.1
A-585	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	13.4	857.7	11.5	292.8	7.6	0.0	292.8	3.9	3.0	219.6	1.0	73.2	3.9
A-586	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	72.6	857.7	62.3	292.8	41.0	0.0	292.8	21.3	15.9	219.6	5.3	73.2	21.3
A-587	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	81.1	857.7	69.6	292.8	45.8	0.0	292.8	23.8	17.8	219.6	5.9	73.2	23.8
A-588	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	107.0	857.7	91.8	292.8	60.4	0.0	292.8	31.3	23.5	219.6	7.8	73.2	31.3
A-589	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	105.9	857.7	90.8	292.8	59.8	0.0	292.8	31.0	23.3	219.6	7.8	73.2	31.0
A-590	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	79.3	857.7	68.0	292.8	44.8	0.0	292.8	23.2	17.4	219.6	5.8	73.2	23.2
A-591	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	68.2	857.7	58.5	292.8	38.5	0.0	292.8	2					

TABLE H-1 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

Subcatchment Designation	On/Off-Site	Outlet	MOE TABLE 2 Components					MOE Infiltration Factor	Adjusted Infiltration Factor	Area (m²)	Precipitation (mm/a)	Precipitation Total (m³/a)	Precipitation Surplus (mm/a)	Evapotranspiration (m³/a)	Runon (mm/a)	Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff (m³/a)
			Topography	Soil		Cover										(mm/a)	(m³/a)	(mm/a)	(mm/a)	(m³/a)	(m³/a)	
A-624	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	68.8	857.7	59.1	292.8	38.9	0.0	292.8	20.2	15.1	219.6	5.0	73.2	20.2
A-625	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	68.4	857.7	58.7	292.8	38.6	0.0	292.8	20.0	15.0	219.6	5.0	73.2	20.0
A-626	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	67.1	857.7	57.5	292.8	37.9	0.0	292.8	19.6	14.7	219.6	4.9	73.2	19.6
A-627	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	81.6	857.7	69.9	292.8	46.1	0.0	292.8	23.9	17.9	219.6	6.0	73.2	23.9
A-628	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	66.2	857.7	56.7	292.8	37.4	0.0	292.8	19.4	14.5	219.6	4.8	73.2	19.4
A-629	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	53.0	857.7	45.4	292.8	29.9	0.0	292.8	15.5	11.6	219.6	3.9	73.2	15.5
A-630	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	56.9	857.7	48.8	292.8	32.2	0.0	292.8	16.7	12.5	219.6	4.2	73.2	16.7
A-631	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	1559.9	857.7	1337.9	292.8	881.2	0.0	292.8	456.8	342.6	219.6	114.2	73.2	456.8
A-632	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	66.6	857.7	57.2	292.8	37.6	0.0	292.8	19.5	14.6	219.6	4.9	73.2	19.5
A-633	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	1643.3	857.7	1409.5	292.8	928.3	0.0	292.8	481.2	360.9	219.6	120.3	73.2	481.2
A-634	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	70.5	857.7	60.5	292.8	39.8	0.0	292.8	20.7	15.5	219.6	5.2	73.2	20.7
A-635	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	51.7	857.7	44.4	292.8	29.2	0.0	292.8	15.1	11.4	219.6	3.8	73.2	15.1
A-636	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	2458.3	857.7	2108.5	292.8	1388.6	0.0	292.8	719.8	539.9	219.6	180.0	73.2	719.8
A-637	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	13.3	857.7	11.4	292.8	7.5	0.0	292.8	3.9	2.9	219.6	1.0	73.2	3.9
A-638	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	1111.5	857.7	953.3	292.8	627.8	0.0	292.8	325.5	244.1	219.6	81.4	73.2	325.5
A-639	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	151.7	857.7	130.1	292.8	85.7	0.0	292.8	44.4	33.3	219.6	11.1	73.2	44.4
A-640	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	705.9	857.7	605.5	292.8	398.8	0.0	292.8	206.7	155.0	219.6	51.7	73.2	206.7
A-641	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	95.8	857.7	82.2	292.8	54.1	0.0	292.8	28.1	21.0	219.6	7.0	73.2	28.1
A-642	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	40.3	857.7	34.6	292.8	22.8	0.0	292.8	11.8	8.9	219.6	3.0	73.2	11.8
A-643	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	632.1	857.7	542.2	292.8	357.1	0.0	292.8	185.1	138.8	219.6	46.3	73.2	185.1
A-644	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	77.7	857.7	66.7	292.8	43.9	0.0	292.8	22.8	17.1	219.6	5.7	73.2	22.8
A-645	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	48.6	857.7	41.7	292.8	27.5	0.0	292.8	14.2	10.7	219.6	3.6	73.2	14.2
A-646	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	49.9	857.7	42.8	292.8	28.2	0.0	292.8	14.6	11.0	219.6	3.7	73.2	14.6
A-647	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	250.4	857.7	214.8	292.8	141.4	0.0	292.8	73.3	55.0	219.6	18.3	73.2	73.3
A-648	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	20.0	857.7	17.2	292.8	11.3	0.0	292.8	5.9	4.4	219.6	1.5	73.2	5.9
A-649	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	240.0	857.7	205.8	292.8	135.6	0.0	292.8	70.3	52.7	219.6	17.6	73.2	70.3
A-650	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	1128.3	857.7	967.7	292.8	637.3	0.0	292.8	330.4	247.8	219.6	82.6	73.2	330.4
A-651	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	91.9	857.7	78.8	292.8	51.9	0.0	292.8	26.9	20.2	219.6	6.7	73.2	26.9
A-652	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Ponds	1	1.65	1.00	1776.6	857.7	1523.8	211.7	1147.7	0.0	211.7	376.1	376.1	211.7	0.0	0.0	376.1
A-653	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	1808.8	857.7	1551.4	283.8	1038.0	0.0	283.8	513.4	436.4	241.2	77.0	42.6	513.4
A-654	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	17.9	857.7	15.3	289.8	10.1	0.0	289.8	5.2	4.1	231.9	1.0	58.0	5.2
A-655	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	31.4	857.7	27.0	289.8	17.9	0.0	289.8	9.1	7.3	231.9	1.8	58.0	9.1
A-656	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	22.3	857.7	19.1	289.8	12.7	0.0	289.8	6.5	5.2	231.9	1.3	58.0	6.5
A-657	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	16.4	857.7	14.0	289.8	9.3	0.0	289.8	4.7	3.8	231.9	0.9	58.0	4.7
A-658	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	373.8	857.7	320.6	289.8	212.3	0.0	289.8	108.3	86.7	231.9	21.7	58.0	108.3
A-659	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	277.9	857.7	238.4	289.8	157.8	0.0	289.8	80.6	64.4	231.9	16.1	58.0	80.6
A-660	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt																		

TABLE H-1 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

Subcatchment Designation	On/Off-Site	Outlet	MOE TABLE 2 Components				MOE Infiltration Factor	Adjusted Infiltration Factor	Area (m ²)	Precipitation (mm/a)	Precipitation Total (m ³ /a)	Precipitation Surplus (mm/a)	Evapotranspiration (m ³ /a)	Runon (mm/a)	Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff (m ³ /a)	
			Topography	Soil		Cover									(mm/a)	(m ³ /a)	(mm/a)	(m ³ /a)	(m ³ /a)	(mm/a)		(m ³ /a)
A-693	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.1	190.3	1.1	102.5	3.2
A-694	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	10.9	857.7	9.3	292.8	6.2	0.0	292.8	3.2	2.1	190.3	1.1	102.5	3.2
A-695	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	53.0	857.7	45.4	292.8	29.9	0.0	292.8	15.5	10.1	190.3	5.4	102.5	15.5
A-696	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	50.7	857.7	43.4	292.8	28.6	0.0	292.8	14.8	9.6	190.3	5.2	102.5	14.8
A-697	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	4.5	857.7	3.9	292.8	2.5	0.0	292.8	1.3	0.9	190.3	0.5	102.5	1.3
A-698	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	34.9	857.7	29.9	292.8	19.7	0.0	292.8	10.2	6.6	190.3	3.6	102.5	10.2
A-699	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	53.2	857.7	45.6	292.8	30.0	0.0	292.8	15.6	10.1	190.3	5.4	102.5	15.6
A-700	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	48.5	857.7	41.6	292.8	27.4	0.0	292.8	14.2	9.2	190.3	5.0	102.5	14.2
A-701	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	45.9	857.7	39.4	292.8	25.9	0.0	292.8	13.4	8.7	190.3	4.7	102.5	13.4
A-702	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	44.0	857.7	37.8	292.8	24.9	0.0	292.8	12.9	8.4	190.3	4.5	102.5	12.9
A-703	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	44.4	857.7	38.1	292.8	25.1	0.0	292.8	13.0	8.4	190.3	4.5	102.5	13.0
A-704	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	70.7	857.7	60.6	292.8	39.9	0.0	292.8	20.7	13.4	190.3	7.2	102.5	20.7
A-705	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	114.8	857.7	98.5	292.8	64.8	0.0	292.8	33.6	21.8	190.3	11.8	102.5	33.6
A-706	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	57.4	857.7	49.2	292.8	32.4	0.0	292.8	16.8	10.9	190.3	5.9	102.5	16.8
A-707	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	1826.2	857.7	1566.3	292.8	1031.6	0.0	292.8	534.7	347.6	190.3	187.2	102.5	534.7
A-708	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	954.2	857.7	818.4	292.8	539.0	0.0	292.8	279.4	181.6	190.3	97.8	102.5	279.4
A-709	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	231.9	857.7	198.9	289.8	131.7	0.0	289.8	67.2	47.0	202.9	20.2	86.9	67.2
A-710	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	158.7	857.7	136.1	289.8	90.1	0.0	289.8	46.0	32.2	202.9	13.8	86.9	46.0
A-711	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	66.5	857.7	57.0	289.8	37.8	0.0	289.8	19.3	13.5	202.9	5.8	86.9	19.3
A-712	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	224.1	857.7	192.2	289.8	127.3	0.0	289.8	65.0	45.5	202.9	19.5	86.9	65.0
A-713	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	274.9	857.7	235.8	289.8	156.1	0.0	289.8	79.7	55.8	202.9	23.9	86.9	79.7
A-714	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	238.9	857.7	204.9	289.8	135.6	0.0	289.8	69.2	48.5	202.9	20.8	86.9	69.2
A-715	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	298.4	857.7	256.0	289.8	169.5	0.0	289.8	86.5	60.5	202.9	25.9	86.9	86.5
A-716	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	117.6	857.7	100.8	289.8	66.8	0.0	289.8	34.1	23.9	202.9	10.2	86.9	34.1
A-717	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	9.9	857.7	8.5	289.8	5.6	0.0	289.8	2.9	2.0	202.9	0.9	86.9	2.9
A-718	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.1	2.2	202.9	0.9	86.9	3.1
A-719	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	10.9	857.7	9.3	289.8	6.2	0.0	289.8	3.2	2.2	202.9	0.9	86.9	3.2
A-720	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	52.8	857.7	45.3	289.8	30.0	0.0	289.8	15.3	10.7	202.9	4.6	86.9	15.3
A-721	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	11.4	857.7	9.8	289.8	6.5	0.0	289.8	3.3	2.3	202.9	1.0	86.9	3.3
A-722	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	5.1	857.7	4.4	289.8	2.9	0.0	289.8	1.5	1.0	202.9	0.4	86.9	1.5
A-723	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	46.9	857.7	40.2	289.8	26.6	0.0	289.8	13.6	9.5	202.9	4.1	86.9	13.6
A-724	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	11.6	857.7	10.0	289.8	6.6	0.0	289.8	3.4	2.4	202.9	1.0	86.9	3.4
A-725	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	4.1	857.7	3.5	289.8	2.3	0.0	289.8	1.2	0.8	202.9	0.4	86.9	1.2
A-726	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	13.7	857.7	11.7	289.8	7.8	0.0	289.8	4.0	2.8	202.9	1.2	86.9	4.0
A-727	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	168.0	857.7	144.1	289.8	95.4	0.0	289.8	48.7	34.1	202.9	14.6	86.9	48.7
A-728	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	95.9	857.7	82.3	289.8	54.5	0.0	289.8	27.8	19.5	202.9	8.3	86.9	27.8
A-736	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	113.7	857.7	97.6	289.8	64.6	0.0	289.8	33.0	26.4				

TABLE H-1 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

Subcatchment Designation	On/Off-Site	Outlet	MOE TABLE 2 Components					MOE Infiltration Factor	Adjusted Infiltration Factor	Area (m²)	Precipitation (mm/a)	Precipitation Total (m³/a)	Precipitation Surplus (mm/a)	Evapotranspiration (m³/a)	Runon (mm/a)	Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff (m³/a)
			Topography	Soil		Cover										(mm/a)	(m³/a)	(m³/a)	(mm/a)	(mm/a)	(m³/a)	
A-772	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	100.9	857.7	86.5	292.8	57.0	0.0	292.8	29.5	22.1	219.6	7.4	73.2	29.5
A-773	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	359.3	857.7	308.2	292.8	203.0	0.0	292.8	105.2	78.9	219.6	26.3	73.2	105.2
A-774	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	22827.8	857.7	19579.4	292.8	12895.0	75.4	292.8	8406.6	6304.9	276.2	2101.6	92.1	8406.6
A-775	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	3797.4	857.7	3257.0	283.8	2179.2	0.0	283.8	1077.8	916.1	241.2	161.7	42.6	1077.8
A-776	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Lawns	0.05	0.60	0.60	5712.0	857.7	4899.2	301.8	3175.2	0.0	301.8	1724.0	1034.4	181.1	689.6	120.7	1724.0
A-777	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	37.5	857.7	32.1	289.8	21.3	0.0	289.8	10.9	8.7	231.9	2.2	58.0	10.9
A-778	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	33.0	857.7	28.3	289.8	18.7	0.0	289.8	9.6	7.6	231.9	1.9	58.0	9.6
A-779	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Wooded Area	0.2	0.75	0.75	50.1	857.7	43.0	283.8	28.8	0.0	283.8	14.2	10.7	212.9	3.6	71.0	14.2
A-780	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Wooded Area	0.2	0.75	0.75	23.1	857.7	19.8	283.8	13.3	0.0	283.8	6.6	4.9	212.9	1.6	71.0	6.6
A-781	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Wooded Area	0.2	0.75	0.75	9.9	857.7	8.5	283.8	5.7	0.0	283.8	2.8	2.1	212.9	0.7	71.0	2.8
A-782	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	15.8	857.7	13.6	292.8	8.9	0.0	292.8	4.6	3.0	190.3	1.6	102.5	4.6
A-783	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	81.6	857.7	70.0	292.8	46.1	0.0	292.8	23.9	15.5	190.3	8.4	102.5	23.9
A-784	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	116.4	857.7	99.9	292.8	65.8	0.0	292.8	34.1	22.2	190.3	11.9	102.5	34.1
A-785	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	107.2	857.7	91.9	292.8	60.5	0.0	292.8	31.4	20.4	190.3	11.0	102.5	31.4
A-786	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	48.9	857.7	41.9	292.8	27.6	0.0	292.8	14.3	9.3	190.3	5.0	102.5	14.3
A-787	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	10.6	857.7	9.1	292.8	6.0	0.0	292.8	3.1	2.0	190.3	1.1	102.5	3.1
A-788	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	31.1	857.7	26.7	292.8	17.6	0.0	292.8	9.1	5.9	190.3	3.2	102.5	9.1
A-789	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	390.3	857.7	334.7	292.8	220.5	0.0	292.8	114.3	74.3	190.3	40.0	102.5	114.3
A-790	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	13.7	857.7	11.8	292.8	7.8	0.0	292.8	4.0	2.6	190.3	1.4	102.5	4.0
A-791	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	727.0	857.7	623.6	292.8	410.7	0.0	292.8	212.9	138.4	190.3	74.5	102.5	212.9
A-792	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	26.9	857.7	23.0	292.8	15.2	0.0	292.8	7.9	5.1	190.3	2.8	102.5	7.9
A-793	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Cultivated	0.1	0.65	0.65	195.2	857.7	167.4	292.8	110.2	0.0	292.8	57.1	37.1	190.3	20.0	102.5	57.1
A-794	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	1184.2	857.7	1015.7	289.8	672.5	0.0	289.8	343.2	240.2	202.9	103.0	86.9	343.2
A-795	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	388.6	857.7	333.3	289.8	220.7	0.0	289.8	112.6	78.8	202.9	33.8	86.9	112.6
A-796	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	372.1	857.7	319.1	289.8	211.3	0.0	289.8	107.8	75.5	202.9	32.3	86.9	107.8
A-797	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	72.2	857.7	62.0	289.8	41.0	0.0	289.8	20.9	14.7	202.9	6.3	86.9	20.9
A-798	On Site	Off-Site to SE Corner - Via Creek	0.15	Silt Loam	0.4	Uncultivated	0.15	0.70	0.70	8.4	857.7	7.2	289.8	4.8	0.0	289.8	2.4	1.7	202.9	0.7	86.9	2.4
A-799	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	12124.5	857.7	10399.2	292.8	6848.9	0.0	292.8	3550.3	2662.7	219.6	887.6	73.2	3550.3
A-800	On Site	Off-Site to SE Corner - Via Creek	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	29805.7	857.7	25564.3	292.8	16836.6	17.5	310.3	9248.7	6936.5	232.7	2312.2	77.6	9248.7
Catchment A Subtotal										262,459	858	225,112	294	147,943	#REF!	303	79,650	59,574	227	20,077	76	79,650
B-11	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Building	0	0.65	0.00	11.0	857.7	9.4	771.9	0.9	0.0	771.9	8.5	0.0	0.0	8.5	771.9	8.5
B-12	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Building	0	0.65	0.00	61.1	857.7	52.4	771.9	5.2	0.0	771.9	47.1	0.0	0.0	47.1	771.9	47.1
B-13	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Building	0	0.65	0.00	15.5	857.7	13.3	771.9	1.3	0.0	771.9	11.9	0.0	0.0	11.9	771.9	11.9
B-14	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Gravel	0.05	0.70	0.70	22.7	857.7	19.5	301.8	12.6	0.0	301.8	6.9	4.8	211.3	2.1	90.5	6.9
B-15	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Gravel	0.05	0.70	0.70	2.6	857.7	2.2	301.8	1.4	0.0	301.8	0.8	0.5	211.3	0.2	90.5	0.8
B-16	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Gravel	0.05	0.70	0.70	9.7	857.7	8.3	301.8	5.4	0.0	301.8	2.9	2.0	211.3	0.9	90.5	2.9
B-17	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Gravel	0.05	0.70	0.70	16.9	857.7	14.5	301.8	9.4	0.0	301.8	5.1	3.6	211.3	1.5	90.5	5.1
B-																						

TABLE H-1 PRE-DEVELOPMENT WATER BUDGET (BY CATCHMENT)
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

Subcatchment Designation	On/Off-Site	Outlet	MOE TABLE 2 Components					MOE Infiltration Factor	Adjusted Infiltration Factor	Area (m²)	Precipitation (mm/a)	Precipitation Total (m³/a)	Precipitation Surplus (mm/a)	Evapotranspiration (m³/a)	Runon (mm/a)	Net Surplus		Infiltration		Runoff*		Total Infiltration + Runoff (m³/a)
			Topography	Soil		Cover										(mm/a)	(m³/a)	(m³/a)	(mm/a)	(m³/a)	(mm/a)	
B-275	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	9.9	857.7	8.5	301.8	5.5	0.0	301.8	3.0	2.1	211.3	0.9	90.5	3.0
B-276	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	5.3	857.7	4.5	301.8	2.9	0.0	301.8	1.6	1.1	211.3	0.5	90.5	1.6
B-277	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	13.5	857.7	11.6	301.8	7.5	0.0	301.8	4.1	2.9	211.3	1.2	90.5	4.1
B-278	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	4.8	857.7	4.1	301.8	2.7	0.0	301.8	1.5	1.0	211.3	0.4	90.5	1.5
B-279	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	37.0	857.7	31.7	301.8	20.5	0.0	301.8	11.2	7.8	211.3	3.3	90.5	11.2
B-280	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	36.0	857.7	30.8	301.8	20.0	0.0	301.8	10.9	7.6	211.3	3.3	90.5	10.9
B-281	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	2.1	857.7	1.8	301.8	1.2	0.0	301.8	0.6	0.4	211.3	0.2	90.5	0.6
B-282	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	52.8	857.7	45.3	301.8	29.4	0.0	301.8	15.9	11.2	211.3	4.8	90.5	15.9
B-283	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	34.9	857.7	30.0	301.8	19.4	0.0	301.8	10.5	7.4	211.3	3.2	90.5	10.5
B-284	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	502.5	857.7	431.0	301.8	279.3	0.0	301.8	151.7	106.2	211.3	45.5	90.5	151.7
B-285	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	14.9	857.7	12.8	301.8	8.3	0.0	301.8	4.5	3.2	211.3	1.4	90.5	4.5
B-286	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	65.2	857.7	56.0	301.8	36.3	0.0	301.8	19.7	13.8	211.3	5.9	90.5	19.7
B-287	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	551.9	857.7	473.3	301.8	306.8	0.0	301.8	166.6	116.6	211.3	50.0	90.5	166.6
B-288	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	253.8	857.7	217.7	301.8	141.1	0.0	301.8	76.6	53.6	211.3	23.0	90.5	76.6
B-289	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	252.2	857.7	216.3	301.8	140.2	0.0	301.8	76.1	53.3	211.3	22.8	90.5	76.1
B-290	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	136.2	857.7	116.8	301.8	75.7	0.0	301.8	41.1	28.8	211.3	12.3	90.5	41.1
B-291	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	18.3	857.7	15.7	301.8	10.2	0.0	301.8	5.5	3.9	211.3	1.7	90.5	5.5
B-292	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	252.1	857.7	216.2	301.8	140.1	0.0	301.8	76.1	53.3	211.3	22.8	90.5	76.1
B-293	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	3.4	857.7	2.9	301.8	1.9	0.0	301.8	1.0	0.7	211.3	0.3	90.5	1.0
B-294	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	10.4	857.7	8.9	301.8	5.8	0.0	301.8	3.1	2.2	211.3	0.9	90.5	3.1
B-295	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	210.3	857.7	180.4	301.8	116.9	0.0	301.8	63.5	44.4	211.3	19.0	90.5	63.5
B-730	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Gravel	0.05	0.70	0.70	3.2	857.7	2.7	301.8	1.8	0.0	301.8	1.0	0.7	211.3	0.3	90.5	1.0
B-731	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Gravel	0.05	0.70	0.70	33.6	857.7	28.8	301.8	18.7	0.0	301.8	10.1	7.1	211.3	3.0	90.5	10.1
B-732	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	13.7	857.7	11.7	289.8	7.8	0.0	289.8	4.0	3.2	231.9	0.8	58.0	4.0
B-733	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	22.0	857.7	18.9	289.8	12.5	0.0	289.8	6.4	5.1	231.9	1.3	58.0	6.4
B-734	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	160.1	857.7	137.4	289.8	90.9	0.0	289.8	46.4	37.1	231.9	9.3	58.0	46.4
B-735	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Uncultivated	0.15	0.80	0.80	118.3	857.7	101.4	289.8	67.2	0.0	289.8	34.3	27.4	231.9	6.9	58.0	34.3
B-754	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	39.2	857.7	33.7	301.8	21.8	0.0	301.8	11.8	8.3	211.3	3.6	90.5	11.8
B-755	On Site	Offsite SW Corner - Overland Flow	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	597.5	857.7	512.5	301.8	332.2	0.0	301.8	180.4	126.2	211.3	54.1	90.5	180.4
Catchment B Subtotal										6,680	857.7	5,729	303.7	3,701	0.0	303.7	2,028	1,442	215.9	586	87.8	2,028
TOTAL SITE										269,139	857.7	230,841	294.3	151,644	9.2	303.5	81,679	61,016	226.7	20,663	76.8	81,679

25.30%

Off-Site Portion (Run-On to the Site)																						
C-7	Off Site	On site to Catchment A-774	0.25	Silt Loam	0.4	Wooded Area	0.2	0.85	0.85	1496.6	857.7	1283.6	283.8	858.9	0.0	283.8	424.8	361.1	241.2	63.7	42.6	424.8
C-260	Off Site	On site to Catchment A-774	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	22654.9	857.7	19431.1	292.8	12797.3	0.0	292.8	6633.8	4975.4	219.6	1658.5	73.2	6633.8
Catchment E Total										24,152	858	20,715	292	13,656	#REF!	292	7,059	5,336	221	1,722	71	7,059
D-729	Off Site	On site to Catchment A-113	0.25	Silt Loam	0.4	Lawns	0.05	0.70	0.70	2636.5	857.7	2261.3	301.8	1465.6	0.0	301.8	795.8	557.0	211.3	238.7	90.5	795.8
Catchment D Total										2,637	858	2,261	302	1,466	0	302	796	557	211	239	91	796
E-1	Off Site	Onsite to Catchment A-800	0.25	Silt Loam	0.4	Cultivated	0.1	0.75	0.75	7116.8	857.7	6104.1	292.8	4020.2	0.0	292.8	2083.9	1563.0	219.6	521.0	73.2	2083.9
Catchment G Total										7,117	858	6,104	293	4,020	0	293	2,084	1,563	220	521	73	2,084
External Areas Total										33,905	858	29,080	293	19,142	0	293	9,938	7,456	220	2,482	73	9,938

NOTES: 1) Subcatchment areas were delineated using the development plans provided by WSP.
2) "" Infiltration factors components are based on land use information provided by Ontario Base Mapping.

Total of On-Site Infiltration* 61,016 (m³/a)
Total of On-Site Runoff 20,663 (m³/a)

APPENDIX



WATER BUDGET CALCULATIONS – POST DEVELOPMENT

TABLE I-1 POST-DEVELOPMENT WATER BUDGET
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

ANNUAL PRECIPITATION	EVAPOTRANSPIRATION AND EVAPOTRANSPIRATION FACTORS				
	Impervious Areas		Ponds		
mm	%	mm	%	mm	
858	10%	86	75%	646	

On-site Subcatchments	Area (m ²)	Outlet	Total Impervious (m ²)	Total Pervious (m ²)	Infiltration Factor Components*						MOE Infiltration Factor	Adjusted Infiltration Factor	Inputs																Outputs															
					Topography	Soil	Cover		Precipitation				Run-on		Total Inputs		Evapotranspiration						Infiltration				Runoff				Total Outputs													
									Annual Average	Surplus			(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	Pervious		Impervious		Total Evapotranspiration		Pervious Areas		Total Infiltration		Pervious		Total Impervious		Total Runoff		Total Outputs									
																			(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)		
201a-11	11.0	Off-Site South East via RLCB/Storm Sewers and Sand Filter Plunge Pool	0	11	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	9.4	301.8	3.3	0.0	0	857.7	9.4	555.9	6.1	0.0	0.0	555.9	6.1	211.3	2.3	211.3	2.3	90.5	1.0	0.0	0.0	90.5	1.0	857.7	9.4							
201a-113	2203.3	Off-Site South East via RLCB/Storm Sewers and Sand Filter Plunge Pool	0	2,203	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	1889.8	301.8	665.0	108.3	239	966.0	2128.5	555.9	1224.8	0.0	0.0	555.9	1224.8	287.1	632.6	287.1	632.6	123.1	271.1	0.0	0.0	123.1	271.1	966.0	2128.5							
201a-24	9.8	Off-Site South East via RLCB/Storm Sewers and Sand Filter Plunge Pool	0	10	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	8.4	301.8	3.0	0.0	0	857.7	8.4	555.9	5.5	0.0	0.0	555.9	5.5	211.3	2.1	211.3	2.1	90.5	0.9	0.0	0.0	90.5	0.9	857.7	8.4							
201a-288	253.8	Off-Site South East via RLCB/Storm Sewers and Sand Filter Plunge Pool	0	254	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	217.7	301.8	76.6	0.0	0	857.7	217.7	555.9	141.1	0.0	0.0	555.9	141.1	211.3	53.6	211.3	53.6	90.5	23.0	0.0	0.0	90.5	23.0	857.7	217.7							
201a-299	217.5	Off-Site South East via RLCB/Storm Sewers and Sand Filter Plunge Pool	0	217	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	186.5	301.8	65.6	0.0	0	857.7	186.5	555.9	120.9	0.0	0.0	555.9	120.9	211.3	45.9	211.3	45.9	90.5	19.7	0.0	0.0	90.5	19.7	857.7	186.5							
201a-38	313.8	Off-Site South East via RLCB/Storm Sewers and Sand Filter Plunge Pool	0	314	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	269.1	301.8	94.7	0.0	0	857.7	269.1	555.9	174.4	0.0	0.0	555.9	174.4	211.3	66.3	211.3	66.3	90.5	28.4	0.0	0.0	90.5	28.4	857.7	269.1							
Catchment 201A Total	3,009		0	3,009								858	2,581	301.8	908	79	239	937	2,820	556	1,673	0	0	556	1,673	267	803	267	803	114	344	0	0	114	344	937	2,820							
201b-114	262.3	Sand Filter Plunge Pool via RLCB/Storm Sewers	262	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	225.0	771.9	202.5	0.0	0	857.7	225.0	0.0	0.0	85.8	22.5	85.8	22.5	0.0	0.0	0.0	0.0	0.0	0.0	771.9	202.5	771.9	202.5	857.7	225.0							
201b-115	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0							
201b-116	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0							
201b-117	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0							
201b-118	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0							
201b-119	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0							
201b-12	61.1	Sand Filter Plunge Pool via RLCB/Storm Sewers	61	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	52.4	771.9	47.1	0.0	0	857.7	52.4	0.0	0.0	85.8	5.2	85.8	5.2	0.0	0.0	0.0	0.0	0.0	0.0	771.9	47.1	771.9	47.1	857.7	52.4							
201b-120	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0							
201b-121	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0							
201b-122	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0							
201b-123	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0							
201b-124	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0							
201b-125	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0							
201b-126	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0							
201b-127	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0							
201b-128	237.2	Sand Filter Plunge Pool via RLCB/Storm Sewers	237	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	203.5	771.9	183.1	0.0	0	857.7	203.5	0.0	0.0	85.8	20.3	85.8	20.3	0.0	0.0	0.0	0.0	0.0	0.0	771.9	183.1	771.9	183.1	857.7	203.5							
201b-129	155.1	Sand Filter Plunge Pool via RLCB/Storm Sewers	155	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	133.1	771.9	119.8	0.0	0	857.7	133.1	0.0	0.0	85.8	13.3	85.8	13.3	0.0	0.0	0.0	0.0	0.0	0.0	771.9	119.8	771.9	119.8	857.7	133.1							
201b-13	15.5	Sand Filter Plunge Pool via RLCB/Storm Sewers	15	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	13.3	771.9	11.9	0.0	0	857.7	13.3	0.0	0.0	85.8	1.3	85.8	1.3	0.0	0.0	0.0	0.0	0.0	0.0	771.9	1											

TABLE I-1 POST-DEVELOPMENT WATER BUDGET
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

ANNUAL PRECIPITATION	EVAPORATION AND EVAPOTRANSPIRATION FACTORS				
	Impervious Areas		Ponds		
mm	%	mm	%	mm	
858	10%	86	75%	646	

On-site Subcatchments	Area (m ²)	Outlet	Total Impervious (m ²)	Total Pervious (m ²)	Infiltration Factor Components*					MOE Infiltration Factor	Adjusted Infiltration Factor	Inputs								Outputs																	
					Topography	Soil	Cover	Precipitation	Surplus			Run-on	Total Inputs	Evapotranspiration				Infiltration				Runoff															
														Pervious	Impervious	Total	Pervious Areas	Total Infiltration	Pervious	Total Impervious	Total Runoff	Total Outputs															
																							Annual Average	mm/yr	m ³ /yr	mm/yr	m ³ /yr	mm/yr	m ³ /yr	mm/yr	m ³ /yr	mm/yr	m ³ /yr	mm/yr	m ³ /yr	mm/yr	m ³ /yr
201b-286	65.2	Sand Filter Plunge Pool via RLCB/Storm Sewers	65	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	56.0	771.9	50.4	0.0	0	857.7	56.0	0.0	0.0	85.8	5.6	85.8	5.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	50.4	771.9	50.4	857.7	56.0
201b-289	252.2	Sand Filter Plunge Pool via RLCB/Storm Sewers	252	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	216.3	771.9	194.7	0.0	0	857.7	216.3	0.0	0.0	85.8	21.6	85.8	21.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	194.7	771.9	194.7	857.7	216.3
201b-290	136.2	Sand Filter Plunge Pool via RLCB/Storm Sewers	136	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	116.8	771.9	105.1	0.0	0	857.7	116.8	0.0	0.0	85.8	11.7	85.8	11.7	0.0	0.0	0.0	0.0	0.0	0.0	771.9	105.1	771.9	105.1	857.7	116.8
201b-291	18.3	Sand Filter Plunge Pool via RLCB/Storm Sewers	18	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	15.7	771.9	14.1	0.0	0	857.7	15.7	0.0	0.0	85.8	1.6	85.8	1.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	14.1	771.9	14.1	857.7	15.7
201b-293	3.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	0	3	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	2.9	301.8	1.0	0.0	0	857.7	2.9	555.9	1.9	0.0	0.0	555.9	1.9	211.3	0.7	211.3	0.7	90.5	0.3	0.0	0.0	90.5	0.3	857.7	2.9
201b-294	10.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	0	10	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	8.9	301.8	3.1	0.0	0	857.7	8.9	555.9	5.8	0.0	0.0	555.9	5.8	211.3	2.2	211.3	2.2	90.5	0.9	0.0	0.0	90.5	0.9	857.7	8.9
201b-300	61.2	Sand Filter Plunge Pool via RLCB/Storm Sewers	61	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	52.5	771.9	47.2	0.0	0	857.7	52.5	0.0	0.0	85.8	5.2	85.8	5.2	0.0	0.0	0.0	0.0	0.0	0.0	771.9	47.2	771.9	47.2	857.7	52.5
201b-301	11.9	Sand Filter Plunge Pool via RLCB/Storm Sewers	12	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	10.2	771.9	9.2	0.0	0	857.7	10.2	0.0	0.0	85.8	1.0	85.8	1.0	0.0	0.0	0.0	0.0	0.0	0.0	771.9	9.2	771.9	9.2	857.7	10.2
201b-302	52.3	Sand Filter Plunge Pool via RLCB/Storm Sewers	52	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	44.9	771.9	40.4	0.0	0	857.7	44.9	0.0	0.0	85.8	4.5	85.8	4.5	0.0	0.0	0.0	0.0	0.0	0.0	771.9	40.4	771.9	40.4	857.7	44.9
201b-315	66.2	Sand Filter Plunge Pool via RLCB/Storm Sewers	0	66	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	56.8	301.8	20.0	0.0	0	857.7	56.8	555.9	36.8	0.0	0.0	555.9	36.8	211.3	14.0	211.3	14.0	90.5	6.0	0.0	0.0	90.5	6.0	857.7	56.8
201b-316	75.9	Sand Filter Plunge Pool via RLCB/Storm Sewers	0	76	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	64.9	301.8	22.8	0.0	0	857.7	64.9	555.9	42.1	0.0	0.0	555.9	42.1	211.3	16.0	211.3	16.0	90.5	6.9	0.0	0.0	90.5	6.9	857.7	75.9
201b-317	5.9	Sand Filter Plunge Pool via RLCB/Storm Sewers	0	6	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	5.0	301.8	1.8	0.0	0	857.7	5.0	555.9	3.3	0.0	0.0	555.9	3.3	211.3	1.2	211.3	1.2	90.5	0.5	0.0	0.0	90.5	0.5	857.7	5.0
201b-318	17.6	Sand Filter Plunge Pool via RLCB/Storm Sewers	0	18	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	15.1	301.8	5.3	0.0	0	857.7	15.1	555.9	9.8	0.0	0.0	555.9	9.8	211.3	3.7	211.3	3.7	90.5	1.6	0.0	0.0	90.5	1.6	857.7	15.1
201b-321	115.3	Sand Filter Plunge Pool via RLCB/Storm Sewers	0	115	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	98.9	301.8	34.8	0.0	0	857.7	98.9	555.9	64.1	0.0	0.0	555.9	64.1	211.3	24.4	211.3	24.4	90.5	10.4	0.0	0.0	90.5	10.4	857.7	98.9
201b-342	75.1	Sand Filter Plunge Pool via RLCB/Storm Sewers	75	0	0.25	Silt Loam	0.40	Road	0	0.65	0	857.7	64.4	771.9	57.9	0.0	0	857.7	64.4	0.0	0.0	85.8	6.4	85.8	6.4	0.0	0.0	0.0	0.0	0.0	0.0	771.9	57.9	771.9	57.9	857.7	64.4
201b-39	15.6	Sand Filter Plunge Pool via RLCB/Storm Sewers	16	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	13.4	771.9	12.0	0.0	0	857.7	13.4	0.0	0.0	85.8	1.3	85.8	1.3	0.0	0.0	0.0	0.0	0.0	0.0	771.9	12.0	771.9	12.0	857.7	13.4
201b-40	210.0	Sand Filter Plunge Pool via RLCB/Storm Sewers	210	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	180.1	771.9	162.1	0.0	0	857.7	180.1	0.0	0.0	85.8	18.0	85.8	18.0	0.0	0.0	0.0	0.0	0.0	0.0	771.9	162.1	771.9	162.1	857.7	180.1
201b-41	274.9	Sand Filter Plunge Pool via RLCB/Storm Sewers	275	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	235.8	771.9	212.2	0.0	0	857.7	235.8	0.0	0.0	85.8	23.6	85.8	23.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	212.2	771.9	212.2	857.7	235.8
201b-43	36.1	Sand Filter Plunge Pool via RLCB/Storm Sewers	36	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	31.0	771.9	27.9	0.0	0	857.7	31.0	0.0	0.0	85.8	3.1	85.8	3.1	0.0	0.0	0.0	0.0	0.0	0.0	771.9	27.9	771.9	27.9	857.7	31.0
201b-44	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0
201b-45	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0
201b-46	298.4	Sand Filter Plunge Pool via RLCB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	771.9	230.4	857.7	256.0
201b-47	284.2	Sand Filter Plunge Pool via RLCB/Storm Sewers	284	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	243.8	771.9	219.4	0.0	0	857.7	243.8	0.0	0.0	85.8	24.4	85.8	24.4	0.0	0.0	0.0	0.0	0.0	0.0	771.9	219.4	771.9	219.4	857.7	243.8
201b-48	154.9	Sand Filter Plunge Pool via RLCB/Storm Sewers	155	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	132.9	771.9	119.6	0.0	0	857.7	132.9	0.0	0.0	85.8	13.3	85.8	13.3	0.0	0.0	0.0	0.0	0.0	0.0	771.9	119.6	771.9	119.6	857.7	132.9
201b-49	4.6	Sand Filter Plunge Pool via RLCB/Storm Sewers	5	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	4.0	771.9	3.6	0.0	0	857.7	4.0	0.0	0.0	85.8	0.4	85.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0	771.9	3.6	771.9	3.6	857.7	4.0
201b-51	266.1	Sand Filter Plunge Pool via RLCB/Storm Sewers	266	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	228.2	771.9	205.4	0.0	0	857.7	228.2	0.0	0.0	85.8															

TABLE I-1 POST-DEVELOPMENT WATER BUDGET
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

ANNUAL PRECIPITATION	EVAPOTRANSPIRATION FACTORS				
	Impervious Areas		Ponds		
mm	%	mm	%	mm	
858	10%	86	75%	646	

On-site Subcatchments	Area (m ²)	Outlet	Total Impervious (m ²)	Total Pervious (m ²)	Infiltration Factor Components*			MOE Infiltration Factor	Adjusted Infiltration Factor	Inputs								Outputs																			
					Topography	Soil	Cover			Precipitation				Run-on	Total Inputs	Evapotranspiration				Infiltration				Runoff				Total Outputs									
										Annual Average	Surplus	mm/yr	m ³ /yr			Pervious	Impervious	Total Evapotranspiration	Pervious Areas	Total Infiltration	Pervious	Total Impervious	Total Runoff														
																								(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)		(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	
202-209	53.5	Stormtech 7 via RLOB/Storm Sewers	54	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	45.9	771.9	41.3	0.0	0	857.7	45.9	0.0	0.0	85.8	4.6	85.8	4.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	41.3	771.9	41.3	857.7	45.9
202-210	14.5	Stormtech 7 via RLOB/Storm Sewers	14	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	12.4	771.9	11.2	0.0	0	857.7	12.4	0.0	0.0	85.8	1.2	85.8	1.2	0.0	0.0	0.0	0.0	0.0	0.0	771.9	11.2	771.9	11.2	857.7	12.4
202-211	77.5	Stormtech 7 via RLOB/Storm Sewers	77	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	66.5	771.9	59.8	0.0	0	857.7	66.5	0.0	0.0	85.8	6.6	85.8	6.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	59.8	771.9	59.8	857.7	66.5
202-212	52.0	Stormtech 7 via RLOB/Storm Sewers	52	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	44.6	771.9	40.2	0.0	0	857.7	44.6	0.0	0.0	85.8	4.5	85.8	4.5	0.0	0.0	0.0	0.0	0.0	0.0	771.9	40.2	771.9	40.2	857.7	44.6
202-213	46.2	Stormtech 7 via RLOB/Storm Sewers	46	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	39.6	771.9	35.7	0.0	0	857.7	39.6	0.0	0.0	85.8	4.0	85.8	4.0	0.0	0.0	0.0	0.0	0.0	0.0	771.9	35.7	771.9	35.7	857.7	39.6
202-214	53.2	Stormtech 7 via RLOB/Storm Sewers	53	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	45.6	771.9	41.1	0.0	0	857.7	45.6	0.0	0.0	85.8	4.6	85.8	4.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	41.1	771.9	41.1	857.7	45.6
202-215	43.5	Stormtech 7 via RLOB/Storm Sewers	43	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	37.3	771.9	33.6	0.0	0	857.7	37.3	0.0	0.0	85.8	3.7	85.8	3.7	0.0	0.0	0.0	0.0	0.0	0.0	771.9	33.6	771.9	33.6	857.7	37.3
202-216	51.2	Stormtech 7 via RLOB/Storm Sewers	51	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	43.9	771.9	39.5	0.0	0	857.7	43.9	0.0	0.0	85.8	4.4	85.8	4.4	0.0	0.0	0.0	0.0	0.0	0.0	771.9	39.5	771.9	39.5	857.7	43.9
202-217	37.6	Stormtech 7 via RLOB/Storm Sewers	38	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	32.3	771.9	29.0	0.0	0	857.7	32.3	0.0	0.0	85.8	3.2	85.8	3.2	0.0	0.0	0.0	0.0	0.0	0.0	771.9	29.0	771.9	29.0	857.7	32.3
202-218	45.5	Stormtech 7 via RLOB/Storm Sewers	45	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	39.0	771.9	35.1	0.0	0	857.7	39.0	0.0	0.0	85.8	3.9	85.8	3.9	0.0	0.0	0.0	0.0	0.0	0.0	771.9	35.1	771.9	35.1	857.7	39.0
202-219	41.7	Stormtech 7 via RLOB/Storm Sewers	42	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	35.8	771.9	32.2	0.0	0	857.7	35.8	0.0	0.0	85.8	3.6	85.8	3.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	32.2	771.9	32.2	857.7	35.8
202-220	48.7	Stormtech 7 via RLOB/Storm Sewers	49	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	41.7	771.9	37.6	0.0	0	857.7	41.7	0.0	0.0	85.8	4.2	85.8	4.2	0.0	0.0	0.0	0.0	0.0	0.0	771.9	37.6	771.9	37.6	857.7	41.7
202-221	47.5	Stormtech 7 via RLOB/Storm Sewers	47	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	40.7	771.9	36.6	0.0	0	857.7	40.7	0.0	0.0	85.8	4.1	85.8	4.1	0.0	0.0	0.0	0.0	0.0	0.0	771.9	36.6	771.9	36.6	857.7	40.7
202-222	43.1	Stormtech 7 via RLOB/Storm Sewers	43	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	37.0	771.9	33.3	0.0	0	857.7	37.0	0.0	0.0	85.8	3.7	85.8	3.7	0.0	0.0	0.0	0.0	0.0	0.0	771.9	33.3	771.9	33.3	857.7	37.0
202-223	25.9	Stormtech 7 via RLOB/Storm Sewers	26	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	22.2	771.9	20.0	0.0	0	857.7	22.2	0.0	0.0	85.8	2.2	85.8	2.2	0.0	0.0	0.0	0.0	0.0	0.0	771.9	20.0	771.9	20.0	857.7	22.2
202-224	44.8	Stormtech 7 via RLOB/Storm Sewers	45	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	38.4	771.9	34.6	0.0	0	857.7	38.4	0.0	0.0	85.8	3.8	85.8	3.8	0.0	0.0	0.0	0.0	0.0	0.0	771.9	34.6	771.9	34.6	857.7	38.4
202-225	18.9	Stormtech 7 via RLOB/Storm Sewers	19	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	16.2	771.9	14.6	0.0	0	857.7	16.2	0.0	0.0	85.8	1.6	85.8	1.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	14.6	771.9	14.6	857.7	16.2
202-226	128.4	Stormtech 7 via RLOB/Storm Sewers	128	0	0.25	Silt Loam	0.40	Concrete	0	0.65	0	857.7	110.1	771.9	99.1	0.0	0	857.7	110.1	0.0	0.0	85.8	11.0	85.8	11.0	0.0	0.0	0.0	0.0	0.0	0.0	771.9	99.1	771.9	99.1	857.7	110.1
202-228	28.6	Stormtech 7 via RLOB/Storm Sewers	29	0	0.25	Silt Loam	0.40	Concrete	0	0.65	0	857.7	24.5	771.9	22.1	0.0	0	857.7	24.5	0.0	0.0	85.8	2.5	85.8	2.5	0.0	0.0	0.0	0.0	0.0	0.0	771.9	22.1	771.9	22.1	857.7	24.5
202-246	14.7	Stormtech 7 via RLOB/Storm Sewers	0	15	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	12.6	301.8	4.4	0.0	0	857.7	12.6	555.9	8.2	0.0	0.0	555.9	8.2	211.3	3.1	211.3	3.1	90.5	1.3	0.0	0.0	90.5	1.3	857.7	12.6
202-247	4.3	Stormtech 7 via RLOB/Storm Sewers	0	4	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	3.7	301.8	1.3	0.0	0	857.7	3.7	555.9	2.4	0.0	0.0	555.9	2.4	211.3	0.9	211.3	0.9	90.5	0.4	0.0	0.0	90.5	0.4	857.7	3.7
202-248	74.7	Stormtech 7 via RLOB/Storm Sewers	0	75	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	64.1	301.8	22.5	0.0	0	857.7	64.1	555.9	41.5	0.0	0.0	555.9	41.5	211.3	15.8	211.3	15.8	90.5	6.8	0.0	0.0	90.5	6.8	857.7	64.1
202-249	56.7	Stormtech 7 via RLOB/Storm Sewers	0	57	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	48.7	301.8	17.1	0.0	0	857.7	48.7	555.9	31.5	0.0	0.0	555.9	31.5	211.3	12.0	211.3	12.0	90.5	5.1	0.0	0.0	90.5	5.1	857.7	48.7
202-250	97.4	Stormtech 7 via RLOB/Storm Sewers	0	97	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	83.6	301.8	29.4	0.0	0	857.7	83.6	555.9	54.2	0.0	0.0	555.9	54.2	211.3	20.6	211.3	20.6	90.5	8.8	0.0	0.0	90.5	8.8	857.7	83.6
202-264	143.4	Stormtech 7 via RLOB/Storm Sewers	143	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	123.0	771.9	110.7	0.0	0	857.7	123.0	0.0	0.0	85.8	12.3	85.8	12.3	0.0	0.0	0.0	0.0	0.0	0.0	771.9	110.7	771.9	110.7	857.7	123.0
202-271	24.7	Stormtech 7 via RLOB/Storm Sewers	25	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	21.2	771.9	19.1	0.0	0	857.7	21.2	0.0	0.0	85.8	2.1	85.8	2.1	0.0	0.0	0.0	0.0	0.0	0.0	771.9					

TABLE I-1 POST-DEVELOPMENT WATER BUDGET
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

On-site Subcatchments	Area (m ²)	Outlet	Total Impervious (m ²)	Total Pervious (m ²)	Infiltration Factor Components*					MOE Infiltration Factor	Adjusted Infiltration Factor	Inputs						Outputs																			
					Topography	Soil	Cover	Precipitation	Surplus			Run-on	Total Inputs	Evapotranspiration			Infiltration		Runoff			Total Outputs															
														Pervious	Impervious	Total	Pervious Areas	Total Infiltration	Pervious	Total Impervious	Total Runoff																
																							Annual Average	mm/yr	m ³ /yr	mm/yr	m ³ /yr	mm/yr	m ³ /yr	mm/yr	m ³ /yr	mm/yr	m ³ /yr	mm/yr	m ³ /yr	mm/yr	m ³ /yr
202-725	4.1	Stormtech 7 via RLCB/Storm Sewers	0	4	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	3.5	301.8	1.2	0.0	0	857.7	3.5	555.9	2.3	0.0	0.0	555.9	2.3	211.3	0.9	211.3	0.9	90.5	0.4	0.0	0.0	90.5	0.4	857.7	3.5
202-726	13.7	Stormtech 7 via RLCB/Storm Sewers	0	14	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	11.7	301.8	4.1	0.0	0	857.7	11.7	555.9	7.6	0.0	0.0	555.9	7.6	211.3	2.9	211.3	2.9	90.5	1.2	0.0	0.0	90.5	1.2	857.7	11.7
202-727	168.0	Stormtech 7 via RLCB/Storm Sewers	0	168	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	144.1	301.8	50.7	0.0	0	857.7	144.1	555.9	93.4	0.0	0.0	555.9	93.4	211.3	35.5	211.3	35.5	90.5	15.2	0.0	0.0	90.5	15.2	857.7	144.1
202-730	3.2	Stormtech 7 via RLCB/Storm Sewers	0	3	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	2.7	301.8	1.0	0.0	0	857.7	2.7	555.9	1.8	0.0	0.0	555.9	1.8	211.3	0.7	211.3	0.7	90.5	0.3	0.0	0.0	90.5	0.3	857.7	2.7
202-731	33.6	Stormtech 7 via RLCB/Storm Sewers	0	34	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	28.8	301.8	10.1	0.0	0	857.7	28.8	555.9	18.7	0.0	0.0	555.9	18.7	211.3	7.1	211.3	7.1	90.5	3.0	0.0	0.0	90.5	3.0	857.7	28.8
202-732	13.7	Stormtech 7 via RLCB/Storm Sewers	0	14	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	11.7	301.8	4.1	0.0	0	857.7	11.7	555.9	7.6	0.0	0.0	555.9	7.6	211.3	2.9	211.3	2.9	90.5	1.2	0.0	0.0	90.5	1.2	857.7	11.7
202-733	22.0	Stormtech 7 via RLCB/Storm Sewers	0	22	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	18.9	301.8	6.6	0.0	0	857.7	18.9	555.9	12.2	0.0	0.0	555.9	12.2	211.3	4.6	211.3	4.6	90.5	2.0	0.0	0.0	90.5	2.0	857.7	18.9
202-734	160.1	Stormtech 7 via RLCB/Storm Sewers	160	0	0.25	Silt Loam	0.40	Road	0	0.65	0	857.7	137.4	771.9	123.6	0.0	0	857.7	137.4	0.0	0.0	85.8	13.7	85.8	13.7	0.0	0.0	0.0	0.0	0.0	0.0	771.9	123.6	771.9	123.6	857.7	137.4
202-735	118.3	Stormtech 7 via RLCB/Storm Sewers	118	0	0.25	Silt Loam	0.40	Road	0	0.65	0	857.7	101.4	771.9	91.3	0.0	0	857.7	101.4	0.0	0.0	85.8	10.1	85.8	10.1	0.0	0.0	0.0	0.0	0.0	0.0	771.9	91.3	771.9	91.3	857.7	101.4
202-736	113.7	Stormtech 7 via RLCB/Storm Sewers	0	114	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	97.6	301.8	34.3	0.0	0	857.7	97.6	555.9	63.2	0.0	0.0	555.9	63.2	211.3	24.0	211.3	24.0	90.5	10.3	0.0	0.0	90.5	10.3	857.7	97.6
202-737	54.8	Stormtech 7 via RLCB/Storm Sewers	0	55	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	47.0	301.8	16.5	0.0	0	857.7	47.0	555.9	30.4	0.0	0.0	555.9	30.4	211.3	11.6	211.3	11.6	90.5	5.0	0.0	0.0	90.5	5.0	857.7	47.0
202-742	1119.9	Stormtech 7 via RLCB/Storm Sewers	0	1,120	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	1008.8	301.8	355.0	0.0	0	857.7	1008.8	555.9	653.8	0.0	0.0	555.9	653.8	211.3	248.5	211.3	248.5	90.5	106.5	0.0	0.0	90.5	106.5	857.7	1008.8
202-743	24.9	Stormtech 7 via RLCB/Storm Sewers	0	25	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	21.4	301.8	7.5	0.0	0	857.7	21.4	555.9	13.8	0.0	0.0	555.9	13.8	211.3	5.3	211.3	5.3	90.5	2.3	0.0	0.0	90.5	2.3	857.7	21.4
202-744	88.5	Stormtech 7 via RLCB/Storm Sewers	0	88	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	75.9	301.8	26.7	0.0	0	857.7	75.9	555.9	49.2	0.0	0.0	555.9	49.2	211.3	18.7	211.3	18.7	90.5	8.0	0.0	0.0	90.5	8.0	857.7	75.9
202-745	15.6	Stormtech 7 via RLCB/Storm Sewers	0	16	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	13.4	301.8	4.7	0.0	0	857.7	13.4	555.9	8.7	0.0	0.0	555.9	8.7	211.3	3.3	211.3	3.3	90.5	1.4	0.0	0.0	90.5	1.4	857.7	13.4
202-746	16.3	Stormtech 7 via RLCB/Storm Sewers	0	16	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	13.9	301.8	4.9	0.0	0	857.7	13.9	555.9	9.0	0.0	0.0	555.9	9.0	211.3	3.4	211.3	3.4	90.5	1.5	0.0	0.0	90.5	1.5	857.7	13.9
202-747	68.1	Stormtech 7 via RLCB/Storm Sewers	0	68	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	58.4	301.8	20.5	0.0	0	857.7	58.4	555.9	37.8	0.0	0.0	555.9	37.8	211.3	14.4	211.3	14.4	90.5	6.2	0.0	0.0	90.5	6.2	857.7	58.4
202-748	927.8	Stormtech 7 via RLCB/Storm Sewers	0	928	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	795.7	301.8	280.0	0.0	0	857.7	795.7	555.9	515.7	0.0	0.0	555.9	515.7	211.3	196.0	211.3	196.0	90.5	84.0	0.0	0.0	90.5	84.0	857.7	795.7
202-749	790.8	Stormtech 7 via RLCB/Storm Sewers	791	0	0.25	Silt Loam	0.40	Road	0	0.65	0	857.7	678.3	771.9	610.5	0.0	0	857.7	678.3	0.0	0.0	85.8	67.8	85.8	67.8	0.0	0.0	0.0	0.0	0.0	0.0	771.9	610.5	771.9	610.5	857.7	678.3
202-750	527.9	Stormtech 7 via RLCB/Storm Sewers	528	0	0.25	Silt Loam	0.40	Road	0	0.65	0	857.7	452.8	771.9	407.5	0.0	0	857.7	452.8	0.0	0.0	85.8	45.3	85.8	45.3	0.0	0.0	0.0	0.0	0.0	0.0	771.9	407.5	771.9	407.5	857.7	452.8
202-754	39.2	Stormtech 7 via RLCB/Storm Sewers	0	39	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	33.7	301.8	11.8	0.0	0	857.7	33.7	555.9	21.8	0.0	0.0	555.9	21.8	211.3	8.3	211.3	8.3	90.5	3.6	0.0	0.0	90.5	3.6	857.7	33.7
202-755	597.5	Stormtech 7 via RLCB/Storm Sewers	0	598	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	512.5	301.8	180.4	0.0	0	857.7	512.5	555.9	332.2	0.0	0.0	555.9	332.2	211.3	126.2	211.3	126.2	90.5	54.1	0.0	0.0	90.5	54.1	857.7	512.5
202-76	147.5	Stormtech 7 via RLCB/Storm Sewers	148	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	126.5	771.9	113.9	0.0	0	857.7	126.5	0.0	0.0	85.8	12.7	85.8	12.7	0.0	0.0	0.0	0.0	0.0	0.0	771.9	113.9	771.9	113.9	857.7	126.5
202-764	59.5	Stormtech 7 via RLCB/Storm Sewers	60	0	0.25	Silt Loam	0.40	Road	0	0.65	0	857.7	51.1	771.9	45.9	0.0	0	857.7	51.1	0.0	0.0	85.8	5.1	85.8	5.1	0.0	0.0	0.0	0.0	0.0	0.0	771.9	45.9	771.9	45.9	857.7	51.1
202-765	42.9																																				

TABLE I-1 POST-DEVELOPMENT WATER BUDGET
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
 5426, 5452, 5584 Lakeshore Road, Ballantrae
 Town of Whitchurch-Stouffville, Ontario

ANNUAL PRECIPITATION	EVAPORATION AND EVAPOTRANSPIRATION FACTORS			
	Impervious Areas		Ponds	
	%	mm	%	mm
858	10%	86	75%	646

On-site Subcatchments	Area (m²)	Outlet	Total Impervious (m²)	Total Pervious (m²)	Infiltration Factor Components*			MOE Infiltration Factor	Adjusted Infiltration Factor	Inputs				Evapotranspiration				Infiltration				Runoff				Total Outputs											
					Topography	Soil	Cover			Precipitation		Run-on	Total Inputs		Pervious		Impervious		Total Evapotranspiration	Pervious Areas		Total Infiltration	Pervious		Total Impervious		Total Runoff	Total Outputs									
										Annual Average	Surplus		(mm/yr)	(m³/yr)	(mm/yr)	(m³/yr)	(mm/yr)	(m³/yr)		(mm/yr)	(m³/yr)		(mm/yr)	(m³/yr)	(mm/yr)	(m³/yr)			(mm/yr)	(m³/yr)	(mm/yr)	(m³/yr)					
203-593	49.4	Stormtech 3 via RCLB/Storm Sewers	0	49	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	42.4	301.8	14.9	0.0	0	857.7	42.4	555.9	27.5	0.0	0.0	555.9	27.5	211.3	10.4	211.3	10.4	90.5	4.5	0.0	0.0	90.5	4.5	857.7	42.4
203-633	1643.3	Stormtech 3 via RCLB/Storm Sewers	0	1,643	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	1409.5	301.8	496.0	0.0	0	857.7	1409.5	555.9	913.5	0.0	0.0	555.9	913.5	211.3	347.2	211.3	347.2	90.5	148.8	0.0	0.0	90.5	148.8	857.7	1409.5
203-642	40.3	Stormtech 3 via RCLB/Storm Sewers	0	40	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	34.6	301.8	12.2	0.0	0	857.7	34.6	555.9	22.4	0.0	0.0	555.9	22.4	211.3	8.5	211.3	8.5	90.5	3.7	0.0	0.0	90.5	3.7	857.7	34.6
203-644	77.7	Stormtech 3 via RCLB/Storm Sewers	0	78	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	66.7	301.8	23.5	0.0	0	857.7	66.7	555.9	43.2	0.0	0.0	555.9	43.2	211.3	16.4	211.3	16.4	90.5	7.0	0.0	0.0	90.5	7.0	857.7	66.7
203-646	49.4	Stormtech 3 via RCLB/Storm Sewers	0	50	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	42.8	301.8	15.1	0.0	0	857.7	42.8	555.9	27.8	0.0	0.0	555.9	27.8	211.3	10.5	211.3	10.5	90.5	4.5	0.0	0.0	90.5	4.5	857.7	42.8
203-648	20.0	Stormtech 3 via RCLB/Storm Sewers	0	20	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	17.2	301.8	6.0	0.0	0	857.7	17.2	555.9	11.1	0.0	0.0	555.9	11.1	211.3	4.2	211.3	4.2	90.5	1.8	0.0	0.0	90.5	1.8	857.7	17.2
CATCHMENT 203 TOTAL	11,036	On-Site Storm Sewers via RCLB	8,024	3,012		Silt Loam						858	9,466	643.6	7,103	0	0	858	9,466	152	1,674	62	688	214	2,363	58	636	25	273	561	6,194	586	6,467	858	9,466		
204a-311	46.2	Stormtech 4 via RCLB/Storm Sewers	46	0	0.25	Silt Loam	0.40	Concrete	0	0.65	0	857.7	39.6	771.9	35.6	0.0	0	857.7	39.6	0.0	0.0	85.8	4.0	85.8	4.0	0.0	0.0	0.0	0.0	0.0	0.0	771.9	35.6	857.7	39.6		
204a-313	27.4	Stormtech 4 via RCLB/Storm Sewers	0	27	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	23.5	301.8	8.3	0.0	0	857.7	23.5	555.9	15.2	0.0	0.0	555.9	15.2	211.3	5.8	211.3	5.8	90.5	2.5	0.0	0.0	90.5	2.5	857.7	23.5
204a-314	24.0	Stormtech 4 via RCLB/Storm Sewers	0	24	0.25	Silt Loam	0.40	Lawns	0.05	0.7	0.7	857.7	20.6	301.8	7.2	0.0	0	857.7	20.6	555.9	13.3	0.0	0.0	555.9	13.3	211.3	5.1	211.3	5.1	90.5	2.2	0.0	0.0	90.5	2.2	857.7	20.6
204a-316	29.0	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	25.0	771.9	23.0	0.0	0	857.7	25.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	23.0	857.7	25.0		
204a-350	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-351	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-352	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-353	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-354	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-355	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-356	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-357	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-358	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-409	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-410	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-411	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-412	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-413	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-414	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-415	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-416	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-417	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-418	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-419	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-420	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-421	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-422	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-423	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-424	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam	0.40	Building	0	0.65	0	857.7	256.0	771.9	230.4	0.0	0	857.7	256.0	0.0	0.0	85.8	25.6	85.8	25.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	230.4	857.7	256.0		
204a-425	298.4	Stormtech 4 via RCLB/Storm Sewers	298	0	0.25	Silt Loam																															

TABLE I-1 POST-DEVELOPMENT WATER BUDGET
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

ANNUAL PRECIPITATION	EVAPORATION AND EVAPOTRANSPIRATION FACTORS				
	Impervious Areas		Ponds		
mm	%	mm	%	mm	
858	10%	86	75%	646	

On-site Subcatchments	Area (m ²)	Outlet	Total Impervious (m ²)	Total Pervious (m ²)	Infiltration Factor Components*			MOE Infiltration Factor	Adjusted Infiltration Factor	Inputs								Outputs																									
					Topography	Soil	Cover			Precipitation				Run-on				Total Inputs				Evapotranspiration				Infiltration				Runoff				Total Outputs									
										Annual Average		Surplus		mm/yr		m ³ /yr		mm/yr		m ³ /yr		mm/yr		m ³ /yr		Pervious		Impervious		Total Evapotranspiration		Pervious Areas		Total Infiltration		Pervious		Total Impervious		Total Runoff		Total Outputs	
										(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)				
204a-504	49.0	Stormtech 4 via RLOB/Storm Sewers	49	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	42.0	771.9	37.8	0.0	0	857.7	42.0	0.0	0.0	85.8	4.2	85.8	4.2	0.0	0.0	0.0	0.0	0.0	0.0	771.9	37.8	771.9	37.8	857.7	42.0						
204a-505	41.5	Stormtech 4 via RLOB/Storm Sewers	41	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	35.6	771.9	32.0	0.0	0	857.7	35.6	0.0	0.0	85.8	3.6	85.8	3.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	32.0	771.9	32.0	857.7	35.6						
204a-506	42.5	Stormtech 4 via RLOB/Storm Sewers	43	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	36.5	771.9	32.8	0.0	0	857.7	36.5	0.0	0.0	85.8	3.6	85.8	3.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	32.8	771.9	32.8	857.7	36.5						
204a-507	49.6	Stormtech 4 via RLOB/Storm Sewers	50	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	42.6	771.9	38.3	0.0	0	857.7	42.6	0.0	0.0	85.8	4.3	85.8	4.3	0.0	0.0	0.0	0.0	0.0	0.0	771.9	38.3	771.9	38.3	857.7	42.6						
204a-508	7.0	Stormtech 4 via RLOB/Storm Sewers	7	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	6.0	771.9	5.4	0.0	0	857.7	6.0	0.0	0.0	85.8	0.6	85.8	0.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	5.4	771.9	5.4	857.7	6.0						
204a-509	53.4	Stormtech 4 via RLOB/Storm Sewers	53	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	45.8	771.9	41.2	0.0	0	857.7	45.8	0.0	0.0	85.8	4.6	85.8	4.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	41.2	771.9	41.2	857.7	45.8						
204a-510	47.9	Stormtech 4 via RLOB/Storm Sewers	48	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	41.1	771.9	37.0	0.0	0	857.7	41.1	0.0	0.0	85.8	4.1	85.8	4.1	0.0	0.0	0.0	0.0	0.0	0.0	771.9	37.0	771.9	37.0	857.7	41.1						
204a-511	45.1	Stormtech 4 via RLOB/Storm Sewers	45	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	38.7	771.9	34.8	0.0	0	857.7	38.7	0.0	0.0	85.8	3.9	85.8	3.9	0.0	0.0	0.0	0.0	0.0	0.0	771.9	34.8	771.9	34.8	857.7	38.7						
204a-512	44.2	Stormtech 4 via RLOB/Storm Sewers	44	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	37.9	771.9	34.1	0.0	0	857.7	37.9	0.0	0.0	85.8	3.8	85.8	3.8	0.0	0.0	0.0	0.0	0.0	0.0	771.9	34.1	771.9	34.1	857.7	37.9						
204a-513	50.3	Stormtech 4 via RLOB/Storm Sewers	50	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	43.1	771.9	38.8	0.0	0	857.7	43.1	0.0	0.0	85.8	4.3	85.8	4.3	0.0	0.0	0.0	0.0	0.0	0.0	771.9	38.8	771.9	38.8	857.7	43.1						
204a-514	50.7	Stormtech 4 via RLOB/Storm Sewers	51	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	43.5	771.9	39.1	0.0	0	857.7	43.5	0.0	0.0	85.8	4.3	85.8	4.3	0.0	0.0	0.0	0.0	0.0	0.0	771.9	39.1	771.9	39.1	857.7	43.5						
204a-515	44.6	Stormtech 4 via RLOB/Storm Sewers	45	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	38.3	771.9	34.5	0.0	0	857.7	38.3	0.0	0.0	85.8	3.9	85.8	3.9	0.0	0.0	0.0	0.0	0.0	0.0	771.9	34.5	771.9	34.5	857.7	38.3						
204a-516	43.6	Stormtech 4 via RLOB/Storm Sewers	44	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	37.4	771.9	33.7	0.0	0	857.7	37.4	0.0	0.0	85.8	3.7	85.8	3.7	0.0	0.0	0.0	0.0	0.0	0.0	771.9	33.7	771.9	33.7	857.7	37.4						
204a-517	50.0	Stormtech 4 via RLOB/Storm Sewers	50	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	42.9	771.9	38.6	0.0	0	857.7	42.9	0.0	0.0	85.8	4.3	85.8	4.3	0.0	0.0	0.0	0.0	0.0	0.0	771.9	38.6	771.9	38.6	857.7	42.9						
204a-518	50.9	Stormtech 4 via RLOB/Storm Sewers	51	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	43.7	771.9	39.3	0.0	0	857.7	43.7	0.0	0.0	85.8	4.4	85.8	4.4	0.0	0.0	0.0	0.0	0.0	0.0	771.9	39.3	771.9	39.3	857.7	43.7						
204a-519	51.5	Stormtech 4 via RLOB/Storm Sewers	52	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	44.2	771.9	39.8	0.0	0	857.7	44.2	0.0	0.0	85.8	4.4	85.8	4.4	0.0	0.0	0.0	0.0	0.0	0.0	771.9	39.8	771.9	39.8	857.7	44.2						
204a-520	51.4	Stormtech 4 via RLOB/Storm Sewers	51	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	44.1	771.9	39.7	0.0	0	857.7	44.1	0.0	0.0	85.8	4.4	85.8	4.4	0.0	0.0	0.0	0.0	0.0	0.0	771.9	39.7	771.9	39.7	857.7	44.1						
204a-521	50.7	Stormtech 4 via RLOB/Storm Sewers	51	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	43.5	771.9	39.1	0.0	0	857.7	43.5	0.0	0.0	85.8	4.3	85.8	4.3	0.0	0.0	0.0	0.0	0.0	0.0	771.9	39.1	771.9	39.1	857.7	43.5						
204a-522	53.4	Stormtech 4 via RLOB/Storm Sewers	53	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	45.8	771.9	41.2	0.0	0	857.7	45.8	0.0	0.0	85.8	4.6	85.8	4.6	0.0	0.0	0.0	0.0	0.0	0.0	771.9	41.2	771.9	41.2	857.7	45.8						
204a-523	55.4	Stormtech 4 via RLOB/Storm Sewers	55	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	47.5	771.9	42.8	0.0	0	857.7	47.5	0.0	0.0	85.8	4.8	85.8	4.8	0.0	0.0	0.0	0.0	0.0	0.0	771.9	42.8	771.9	42.8	857.7	47.5						
204a-524	47.7	Stormtech 4 via RLOB/Storm Sewers	48	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	41.0	771.9	36.9	0.0	0	857.7	41.0	0.0	0.0	85.8	4.1	85.8	4.1	0.0	0.0	0.0	0.0	0.0	0.0	771.9	36.9	771.9	36.9	857.7	41.0						
204a-525	49.8	Stormtech 4 via RLOB/Storm Sewers	50	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	42.7	771.9	38.4	0.0	0	857.7	42.7	0.0	0.0	85.8	4.3	85.8	4.3	0.0	0.0	0.0	0.0	0.0	0.0	771.9	38.4	771.9	38.4	857.7	42.7						
204a-526	47.8	Stormtech 4 via RLOB/Storm Sewers	48	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	41.0	771.9	36.9	0.0	0	857.7	41.0	0.0	0.0	85.8	4.1	85.8	4.1	0.0	0.0	0.0	0.0	0.0	0.0	771.9	36.9	771.9	36.9	857.7	41.0						
204a-527	53.0	Stormtech 4 via RLOB/Storm Sewers	53	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	45.4	771.9	40.9	0.0	0	857.7	45.4	0.0	0.0	85.8	4.5	85.8	4.5	0.0	0.0	0.0	0.0	0.0	0.0	771.9	40.9	771.9	40.9	857.7	45.4						
204a-528	52.9	Stormtech 4 via RLOB/Storm Sewers	53	0	0.25	Silt Loam	0.40	Driveway	0	0.65	0	857.7	45.4	771.9	40.8	0.0	0	857.7	45.4	0.0	0.0	85.8	4.5	85.8	4.5	0.0	0.0	0.0	0.0	0.0	0.0	771.9	40.8	771.9	40.8	857.7	45.4						
204a-529	55.2	Stormtech 4 via RLOB/Storm Sewers	55	0	0.2																																						

TABLE I-1 POST-DEVELOPMENT WATER BUDGET
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

ANNUAL PRECIPITATION	EVAPOTRANSPIRATION FACTORS			
	Impervious Areas		Ponds	
mm	%	mm	%	mm
858	10%	86	75%	646

On-site Subcatchments	Area (m ²)	Outlet	Total Impervious (m ²)	Total Pervious (m ²)	Infiltration Factor Components*						MOE Infiltration Factor	Adjusted Infiltration Factor	Inputs								Outputs																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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TABLE I-1 POST-DEVELOPMENT WATER BUDGET
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE STUDY
5426, 5452, 5584 Lakeshore Road, Ballantrae
Town of Whitchurch-Stouffville, Ontario

ANNUAL PRECIPITATION	EVAPORATION AND EVAPOTRANSPIRATION FACTORS			
	Impervious Areas		Ponds	
	mm	%	mm	%
858		10%	86	75%

On-site Subcatchments	Area (m ²)	Outlet	Total Impervious (m ²)	Total Pervious (m ²)	Infiltration Factor Components*			MOE Infiltration Factor	Adjusted Infiltration Factor	Inputs												Outputs													
					Topography	Soil	Cover			Precipitation		Run-on	Total Inputs		Evapotranspiration			Infiltration				Runoff				Total Outputs									
										Annual Average	Surplus		Pervious	Impervious	Total Evapotranspiration	Pervious Areas	Total Infiltration	Pervious	Total Impervious	Total Runoff															
																					(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)		(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)				
Total Buildings	42,570		42,570	0						858	36,512	771.9	32,861	0.0	0	857.7	36,512	0.0	0	85.8	3,651	85.8	3,651	0.0	0	0.0	0	0.0	0	771.9	32,861	771.9	32,861	857.7	36,512
Paved Areas	23,311		23,311	0						858	19,994	771.9	17,995	0.0	0	857.7	19,994	0.0	0	85.8	1,999	85.8	1,999	0.0	0	0.0	0	0.0	0	771.9	17,995	771.9	17,995	857.7	19,994
Pervious Areas	203,258		0	203,258						858	174,335	292.0	59,350	12.2	2,482	869.9	176,816	565.7	114,984	0.0	0	565.7	114,984	231.6	47,067	231.6	47,067	72.6	14,766	0.0	0	72.6	14,766	869.9	176,816

Off-site Subcatchments	Area (m ²)	Outlet	Total Impervious (m ²)	Total Pervious (m ²)	Infiltration Factor Components*			MOE Infiltration Factor	Adjusted Infiltration Factor	Inputs						Outputs																				
										Precipitation		Run-on		Total Inputs		Evapotranspiration				Infiltration				Runoff				Total Outputs								
										Annual Average		Surplus				Pervious		Impervious		Total		Pervious Areas		Total Infiltration		Pervious				Total Impervious		Total Runoff				
					Topography	Soil	Cover	(mm/yr)		(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)	(mm/yr)	(m ³ /yr)						
210-729	2636.5	On site Catchment 113	0	2,637	0.25	Silt Loam	0.40	Lawns	0.05	0.7	857.7	2261.3	301.8	795.8	0.0	0.0	857.7	2261.3	555.9	1465.6	0.0	0.0	555.9	1465.6	211.3	557.0	211.3	557.0	90.5	238.7	0.0	0.0	90.5	238.7	857.7	2261.3
CATCHMENT 210 TOTAL	2,637		0	2,637							858	2,261	301.8	796	0	0	858	2,261	556	1,466	0	0	556	1,466	211	557	211	557	91	239	0	0	91	239	858	2,261
211-260	22654.9	On-site to Catchment 774	0	22,655	0.25	Silt Loam	0.40	Cultivated	0.1	0.75	857.7	19431.1	292.8	6633.8	0.0	0.0	857.7	19431.1	564.9	12797.3	0.0	0.0	564.9	12797.3	219.6	4975.4	219.6	4975.4	73.2	1658.5	0.0	0.0	73.2	1658.5	857.7	19431.1
211-7	1496.6	On-site to Catchment 774	0	1,497	0.25	Silt Loam	0.40	Wooded Area	0.2	0.85	857.7	1283.6	283.8	424.8	0.0	0.0	857.7	1283.6	573.9	858.9	0.0	0.0	573.9	858.9	241.2	361.1	241.2	361.1	42.6	63.7	0.0	0.0	42.6	63.7	857.7	1283.6
CATCHMENT 211 TOTAL	24,152		0	24,152							858	20,715	292	7,059	0	0	858	20,715	565	13,656	0	0	565	13,656	221	5,336	221	5,336	71	1,722	0	0	71	1,722	858	20,715
214-1	7116.8	On site Catchment 800	0	7,117	0.25	Silt Loam	0.40	Cultivated	0.1	0.75	857.7	6104.1	292.8	2083.9	0.0	0.0	857.7	6104.1	564.9	4020.2	0.0	0.0	564.9	4020.2	219.6	1563.0	219.6	1563.0	73.2	521.0	0.0	0.0	73.2	521.0	857.7	6104.1
CATCHMENT 214 TOTAL	7,117		0	7,117							858	6,104	293	2,084	0	0	858	6,104	565	4,020	0	0	565	4,020	220	1,563	220	1,563	73	521	0	0	73	521	858	6,104
External Areas Total	33,905		0	33,905							858	29,080	293	9,938	0	0	858	29,080	565	19,142	0	0	565	19,142	220	7,456	220	7,456	73	2,482	0	0	73	2,482	858	29,080

- NOTES:
- 1) Subcatchment areas were delineated using the development plans provided by WSP.
 - 2) *** Infiltration factors components are based land use information provided through Ontario Base Mapping.