Project No.: SP17-212-30
August 19, 2020
Tropical Land Development Limited **c/o David Goodman** **1500-439 University Avenue** **Toronto, ON M5G 1Y8** **Attention:** Mr. Mark Jacobs
Re: **RESPONSE LETTER – Second Submission Preliminary Design Comments dated February 25, 2020 by NVCA** **"Tropical Land Developments Ltd." Draft Plan of Subdivision and Zoning By-law Amendment, Town File Nos. 21T-18002C & RZ 18-06, NVCA ID #31842** **0 Mount Pleasant Road, Caledon, Ontario**

Dear Mr. Jacobs,

Sirati Partners & Consultants Limited (SIRATI) is please to provide a letter in response to comments made by Nottawasaga Valley Conservation Authority (NVCA) on "Tropical Land Developments Ltd." Draft Plan of Subdivision and Zoning By-law Amendment.

NVCA staff has reviewed a second submission in support of a proposed Draft Plan of Subdivision and Zoning By-law Amendment to facilitate the development of eight (8) estate residential lots. The reviewed reports included two (2) reports prepared by SIRATI, which are entitled as follows:

1. *"Test Pitting Program - LID Measures-Proposed Roadside Bioswales, 0 Mount Pleasant Road, Caledon- Letter Report"* dated August 28, 2019.
2. *"Hydrogeological Impact Study, Proposed new sub-division, 0 Mt. Pleasant Road, Town of Caledon, Ontario"* dated October 17, 2019.

The comments were made by NVCA on February 25, 2020, including those on Hydrogeological Impact Study report. A copy of the NVCA's comments is attached in this report.

SIRATI would like to respond to NVCA's Comments #7 and #8 on Hydrogeological Impact Study report as follows.

Comment #7:

Section 14.5 summary of water balance calculations-catchment 1 indicates that the total volume of the LIDs associated with roof area is not sufficient to compensate for the total infiltration requirement and "extra sources should be considered". Please outline what this consists of. (It is recognized that this may be out of scope of SIRATI report as indicated in section 14.8 that SIRATI is not providing any design of LID techniques since selection and designing of applicable LID techniques shall be conducted by engineering designers).

Based on the water balance calculation in Catchment 1 area, infiltration deficit is estimated to be 1867 m^3/year, while the roof runoff is estimated to be 1,338 m^3/year, which is not enough to compensate for the infiltration deficit. However, there is an amount of 7,585 m^3/year of runoff estimated from the landscaped area, which is much greater than the amount of infiltration deficit. Therefore, the runoff water collected in the landscape area could be considered a good source to supplement the infiltration.

It is understood that bioswales/infiltration trenches have been designed at locations along the road sides at the Site. The details of the proposed bioswales/infiltration trenches could be found in the Functional Servicing Report prepared for this development.

Comment #8:

Section 15 water quality indicates that the measured concentration of Nitrate as N is 33.1 mg/L. Further, it is understood that the proposed development will be serviced by individual septic systems. Please advise on the reasonable use calculation for nitrate for the septic systems and potential impacts to proximal water wells.

As per the Town of Caledon request, a Nitrate Impact Assessment was completed for the Subject Property and the results were summarized in a report entitled *"Nitrate Impact Assessment Report, Proposed New Subdivision, 0 Mount Pleasant Road, Town of Caledon, Ontario"*, dated September 10, 2019. A copy of this report is attached.

Both on-site and off-site nitrate impacts were assessed. The results of study indicated that 5.64 mg/L nitrate will be added to local groundwater. Considering the background groundwater nitrate concentration of 3.52 mg/L, the resulted nitrate concentration will be below the guideline value of 10 mg/L.

Also, a Reasonable Use Policy (RUP) for nitrate was calculated. The calculated concentration of nitrate at the property boundary is estimated 8.24 mg/L, which met the RUP guideline value of 10 mg/L. Based on

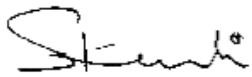
the nitrate concentration assessment, no impacts due to the development are anticipated on the neighbouring properties including water wells.

It should be noted that The Nitrate Impact Assessment report was peer reviewed by Golder Associated Limited (Golder), and the peer reviewer has accepted the conclusions and recommendations of the report. In addition, Golder also peer reviewed the Hydrogeological Impact Study report prepared by SIRATI. A copy of the peer review report is attached in this letter.

We trust that the above information provided would satisfactorily respond to NVCA's comments. Should you have any questions, please contact the undersigned.

Best Regards,

Sirati & Partners Consultants Ltd.



Sudhakar Kurli, M.Sc., P. Geo.
Hydrogeologist/Project Manager

Bujing Guan, M. A.Sc., P. Geo.
Senior Hydrogeologist/Environmental Specialist

Enclosures:

1. NVCA' comments dated February 25, 2020
2. Nitrate Impact Assessment Report, Proposed New Subdivision, 0 Mount Pleasant Road, Town of Caledon, Ontario, dated September 10, 2019
3. Hydrogeological Peer Review, Hydrogeological Impact Study of Mount Pleasant Road, Tropical Land Subdivision, Town of Caledon, Ontario, dated July 7, 2020 by Golder Associated Limited

ENCLOSURES

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

ENCLOSURE 1

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

Nottawasaga Valley
Conservation Authority

February 25, 2020 SENT BY EMAIL

Town of Caledon
6311 Old Church Road
Caledon, ON L7C 1J6

Attn: Ms. Leilani Lee-Yates, BES, MCIP, RPP
Senior Planner, Development – West
Leilani.Lee-Yates@caledon.ca

Dear Ms. Lee-Yates

RE: Second Submission Preliminary Design Comments
"Tropical Land Developments Ltd."
Draft Plan of Subdivision and Zoning By-law Amendment
Town File Nos. 21T-18002C & RZ 18-06
0 Mount Pleasant Road
NVCA ID #31842

Nottawasaga Valley Conservation Authority [NVCA] staff has reviewed a second submission in support of a proposed Draft Plan of Subdivision and Zoning By-law Amendment to facilitate the development of eight (8) estate residential lots.

NVCA staff have received and reviewed the following documents submitted with this application:

- The Biglieri Group Ltd. "Draft Plan of Subdivision" dated June 12, 2019;
- The Biglieri Group Ltd. "Draft Zoning By-law Amendment and Associated Schedules"
- Valdor Engineering "Functional Servicing Report", dated October 2019
- Comment Response Tracker dated November 11, 2019;
- Valdor Engineering, "Engineering Plans" dated October 25, 2019;
- The Biglieri Group Ltd. "Planning Rationale Report" Revised November, 2019;
- Natural Resource Solutions Inc. "Scoped Environmental Impact Study and Reforestation Management Plan" dated October 31, 2019;
- The Biglieri Group Ltd. "Revised Environmental and Engineering Summary Report" dated November 2019;
- Sirati & Partners "Test Pitting Program- LID Measures-Proposed Roadside Bioswales-0 Mount Pleasant Road, Caledon- Letter Report" dated August 28, 2019;
- Sirati & Partners "Hydrogeological Impact Study, Proposed new sub-division, 0 Mt Pleasant Road, Town of Caledon, Ontario" dated October 17, 2019.

Staff has reviewed this application as per our delegated responsibility from the Province to represent provincial interests regarding natural hazards identified in Section 3.1 of the Provincial Policy Statement (PPS, 2014) and as a regulatory authority under Ontario

Regulation 172/06. The application has also been reviewed through our role as a public body under the Planning Act as per our CA Board approved policies. Finally, NVCA has provided comments as per our Municipal Partnership and Service Agreement with the Town of Caledon.

Ontario Regulation 172/06

1. The subject property is partially regulated for meander erosions hazards associated with a tributary of Beeton Creek located in the north end.

Natural Hazard - Regulatory Comments

2. All previous comments have been addressed with no additional comments at this time.

Natural Heritage and Ecology - Advisory Comments

3. All previous comments have been addressed with no additional comments at this time.

Additional Advisory Comments

Stormwater Management:

4. All previous comments have been addressed with no additional comments at this time.

Hydrogeology Impact Study Comments:

5. Staff are supportive that no positive dewatering will be expected during construction (Section 12 titled construction dewatering within the Hydrogeological Impact Study [HIS]) based on the groundwater monitoring that is presented in Section 9 and 10 of the HIS which incorporates the hydrological calendar.
6. If the proponent wishes to promote awareness of the importance of SGRAs and HVAs by means of sign boards explaining the linkage between surface activities and their impact on groundwater quality and quantity as outlined in Section 13 4, please include the NVCA in its development.
7. Section 14.5 summary of water balance calculations-catchment 1 indicates that the total volume of the LIDs associated with roof area is not sufficient to compensate for the total infiltration requirement and "extra sources should be considered". Please outline what this consists of. (It is recognized that this may be out of scope of SIRATI report as indicated in section 14.8 that SIRATI is not providing any design of LID techniques since selection and designing of applicable LID techniques shall be conducted by engineering designers).
8. Section 15 water quality indicates that the measured concentration of Nitrate as N is 33.1 mg/L. Further, it is understood that the proposed development will be serviced by individual septic systems. Please advise on the reasonable use calculation for nitrate for the septic systems and potential impacts to proximal water wells.

Conclusion

We note that these comments are related to this submission and the information provided within this submission. NVCA requires additional information in order to complete our review and additional comments may be provided in the future.

Please feel free to contact the undersigned at extension 233 or aknapp@nvca.on.ca should you require any further information or clarification on any matters contained herein.

Sincerely,

Amy Knapp
Planner II

ENCLOSURE 2

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

NITRATE IMPACT ASSESSMENT REPORT
PROPOSED NEW SUB-DIVISION
0 MOUNT PLEASANT ROAD
TOWN OF CALEDON
ONTARIO

Prepared for:

Tropical Land Developments Limited
c/o David Goodman
1500-439 University Ave
Toronto, ON M5G 1Y8

Prepared By:

SIRATI & PARTNERS CONSULTANTS LIMITED

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions

12700 Keele Street
King City, Ontario L7B 1H5
Tel: 905.833.1582
Fax:905.833.5360

Project: SP17-212-00
September 10, 2019

TABLE OF CONTENTS

FIGURES

APENDICES

1.0 INTRODUCTION AND BACKGROUND

Sirati & Partners Consultants Ltd (SIRATI) was retained by Tropical Land Developments Limited, c/o David Goodman (collectively referred to as the "Client") to conduct a Nitrate Impact Assessment study at the property located at 0 Mount Pleasant Road, Town of Caledon, Ontario (the Subject Property or the Site). The approximate site location is presented on Figure 1-1.

The entire Property is an approximately 12.28-hectare (30.34 acres) parcel of land extending approximately 678.5 metres (m) along northeast and southwest and about 181 m along Mount Pleasant Road. The Property is a cultivated land and includes no structures.

This study was performed in conformance with the Town of Caledon Official Plan Secondary Plan Policies Section 7.1.8.3.

Section 7.1.8.3 indicated that an applicant for an estate residential plan of subdivisions will be required to undertake any studies deemed necessary to assess the termination probability of contaminants on wells in nearby properties by septic system leachate or other sources of contaminants likely to be caused by the proposed development. Accordingly, an assessment of nitrate loadings from the on-site septic systems is being carried out.

It should be noted that a geotechnical investigation was carried out previously at the Site, which consisted of drilling eight (8) boreholes and completion of five (5) monitoring wells in selected boreholes. A hydrogeological study was completed using the data obtained from the geotechnical investigation and the data obtained from the existing monitoring wells. A report entitled "Hydrogeological Impact Study, Proposed New Subdivision, 0 Mount Pleasant Road, Town of Caledon, Ontario" dated September 9, 2019 was prepared by SIRATI. The data or information obtained in the previous investigations was used and incorporated into this report.

2.0 LAND USE

The Subject Property is a vacant undeveloped parcel of land, and is bounded by Mount Pleasant Road to the northeast, vegetated woodlot to the southeast and southwest, and a property with a single/detached residential house to the northwest.

The Site is located within Oak Ridges Moraine Conservation Plan area, in an area designated as Palgrave Estate Residential Community land use area (a component of Countryside Area), where residential development is permitted.

3.0 SITE DEVELOPMENT PLAN

The Subject Property, covering an area of about 12.28 hectares (30.34 acres), was proposed to be developed as a residential subdivision, ultimately comprising of eight (8) single detached custom homes with one-level basement or eight (8) development lots. The proposed site development is shown on Figures 3-1 and 3-2.

It is understood that the source of potable water to the proposed development will be supplied through the Palgrave municipal supply wells, and the new development will be serviced by private septic systems.

4.0 PHYSICAL SETTING

4.1 Topography and Drainage

As shown on Figure 4-1 (The regional topographic map of the study area), the topography of the Site generally ranges in elevation between 290 metres above sea level (mASL) and 300 mASL. Based on Site survey map provided by the Client (Figure 4-2), elevated locations are located in the mid-portion of the Site, where a drainage divide is apparently present in areas of Lots 3, 6 and 7. The highest elevation is identified to be approximately 298.1 mASL in Lot 3.

The Site is located in the area under the jurisdiction of Nottawasaga Valley Conservation Authority (NVCA). The Nottawasaga Valley watershed has nine subwatersheds including Innisfil Creek subwatershed. The Innisfil Creek subwatershed consists of four main creek systems, namely Innisfil Creek, Bailey Creek, Beeton creek and Penville Creek that drain the southeast portion of the Nottawasaga River watershed. The Subject Property falls within the Beeton Creek system of Innisfil Creek subwatershed (Figure 4-3).

Beeton Creek arises on the Oak Ridges Moraine south of Tottenham. Flowing north, the creek enters a reservoir at the Tottenham Conservation Area and then continues downstream. An east branch, originating east of Tottenham, flows westward through agricultural lands and enters Beeton Creek north of Tottenham. Beeton Creek continues to flow northward through an agricultural landscape, skirting the west side of Beeton before joining Bailey Creek and then entering Innisfil Creek.

4.2 Physiography

The Subject Property lies within the physiographic region termed as Oak Ridges Moraine (Figure 4-4). The Oak Ridges Moraine is comprised of rolling sandy hills, hummocky topography and closed depressions that form the source of the headwaters to major stream that drain off the moraine. The Oak Ridges Moraine is an extensive interlobate moraine that extends from the Caledon area, eastward across the northern limits of the Greater Toronto area.

4.3 Overburden Geology

As shown on Figure 4-5, the Subject Property is located in an area covered with ice-contact stratified deposits, which generally consist of gravel and sand deposits, with minor till, and also contain esker, kame, end moraine, ice-marginal delta and subaqueous fan deposits.

The Paleozoic bedrock topography appears to strongly influence the overlying Quaternary sediment thickness and distribution. The thicker Quaternary sediments occur in bedrock topographical lows (i.e. within bedrock valleys and beneath the ORM). The overburden thickness within the Oak Ridges Moraine (ORM) ranges from approximately 56 m to 240 m.

4.4 Bedrock Geology

The bedrock consists of shale, interbedded dolomitic siltstone, and minor limestone, which were deposited in shallow seas about 450 million years ago. These beds, named the Georgian Bay Formation are approximately 250 m thick and dip to the southeast at about 5 m/km. Following long periods of additional sedimentation and erosion, the ancient Laurentian River and its tributaries cut several deep, poorly-defined bedrock valleys trending northwest southeast across the area. As depicted in Figure 4-6, the study area is underlain by the Georgian Bay Formation and have an important influence on drift thickness and groundwater distribution in the study area.

5.0 HYDROGEOLOGY

The regional hydrogeological conditions were assessed using the data obtained from the Ministry of the Environment, Conservation and Parks (MECP) water well database for the domestic water wells and the municipal water wells.

5.1 Private Water Wells

As shown in Figure 5-1, seventeen (17) water wells have been found within a 500 m radius around the property. All these wells were completed between 1966 and 2004, and were screened from the bottom depths ranging from 10 metres below ground surface (mbgs) and 80.4 mbgs (31 ft. to 277 ft.) in medium to coarse sand. No well has encountered bedrock up to the drilled depths of 80.4 mbgs, indicating huge thickness of unconsolidated sediments.

The nearest recorded domestic water wells included the wells #4903748 and #4904792, which are located about 300 m northwest of the Site. Based on the details of the MECP water well records, Well #4903748 was screened between 56.4 mbgs and 57.9 mbgs in coarse sand, with a static water level of 21.3 mbgs, while Well #4904792 was screened between 56.4 mbgs and 57.9 mbgs in sand, with a static water level of 22.9 mbgs.

To present the local geologic profile, a cross-section as shown in Figure 5-2 has been plotted using the information acquired from selected well records.

5.2 Palgrave Municipal Water Supply Wells

The Palgrave community is being serviced by Palgrave municipal supply wells #2, #3 and #4. The Subject Property is situated within a wellhead protection zone, which is associated with the municipal supply well Palgrave Well#3.

Palgrave Well#3 is located about 740 m southwest of the Site, on the northeast side of Mount Hope Road, in Caledon, Ontario. Geologically, Palgrave Well#3 is located near the edge of a local bedrock valley and is overlain by about 80 m thick overburden of Oak Ridges Moraine Aquifer Complex (ORMAC) stratified sediments. This sequence consists (from surface downward) of about four (4) m of sand and gravel, about 35 m of silt and clay with minor sand, about 25 m of gravelly sand and silty sand, a silt and clay unit about five (5) m thick, and finally, about 10 m of gravelly sand where the well is screened (Earthfx , May 2007).

Based on MECP water well record, Palgrave Well#3 was found to have a well ID of 4906859, and was drilled to the depth of approximately 82.3 mbgs into (sandy) clay, and screened between 71.3 mbgs and 80.5 mbgs in (gravelly) sand. The static water level was recorded to be 15.1 mbgs.

Based on the above findings, it can be inferred that layers in a significant thickness of unconsolidated overburden are present in the site area, and multiple sandy soil layers can serve as the aquifer for water supply. However, it is more common that the deeper aquifer is selected for the water supply aquifer, probably because of having a thicker and better protection from the potential contamination.

The ORM is widely recognized as a significant aquifer system and is generally unconfined. The ORM primarily consists of coarse-grained outwash gravel deposits and is reflected by high values of hydraulic conductivity (Gerber and Howard, 2000). Consequently, the ORM complex has become a major source of potable water for domestic wells and communities in the area.

6.0 SOIL AND GROUNDWATER CONDITIONS

6.1 Soil Stratigraphy

The soil stratigraphy of the Site as revealed in the boreholes generally consisted of topsoil with or without fill materials, underlain by native soils of sand, and then by silty sand, silt and sand or sandy silt, locally with silt or clayey silt to silty clay. No bedrock was encountered at the maximum explored depth of 11.2 mbgs.

Figure 6-1 shows the approximate locations of the boreholes and monitoring wells completed in the previous investigations. The details of the soil stratigraphy are presented in Borehole Logs in Appendix A. In addition, two (2) cross sections (as shown on Figures 6-2 and 6-3) were constructed to illustrate the horizontal and vertical extents of the soil and groundwater conditions.

The surficial geology is fairly consistent across the Site, as indicated in the borehole logs. Sand and silty sand are predominant across the site with clayey silt to silty clay situated at deeper depths of 9 m and beyond.

6.2 Groundwater Conditions

Groundwater levels measured in five (5) boreholes (BH/MW1, BH/MW2, BH/MW4, BH/MW6 & BH/MW8) in a monthly monitoring program ranged from 4.41 mbgs and 10.30 mbgs, indicating relatively deep-water table conditions.

The groundwater elevations were recorded to range from 282.3 mASL to 288.2 mASL. The highest groundwater level was measured at MW6, where the high ground elevations are located. Based on the most recent water level data dated March 2018, the groundwater elevation contours were established. As shown on Figure 6-4, groundwater flow appeared to be divergent in the mid-portion of the Site, generally following the surficial topography of the Site.

7.0 GROUNDWATER QUALITY AND BACKGROUND NITRATE CONCENTRATION

7.1 General Water Quality

To assess the general water quality, groundwater samples were collected on July 17, 2019 from three (3) monitoring wells MW1, MW2 and MW4 for chemical analysis (note: the monitoring well MW6 was dry and MW8 was damaged). The samples were submitted to AGAT laboratory for analysis of the parameters as per Water Quality Assessment package provided by AGAT. The analytical results are provided in the Laboratory Certificate of Analysis in Appendix B.

The results were compared with Ontario Drinking Water Quality Standards (ODWQS)-Aesthetic Objectives and Operational Guidelines, and indicated that exceedances or elevated concentrations for aluminum, iron, manganese, total hardness and turbidity were found in all the tested groundwater samples. In addition, nitrate was found exceeding the ODWQS limit of 10 mg/L in groundwater taken from MW1. The exceedances or elevated concentrations may have resulted from the sediments and/or particulates contained in the analyzed water samples.

7.2 Nitrate Concentrations

As part of water quality assessment, nitrate was analyzed in three (3) groundwater samples taken from MW1, MW2 and MW4. The results are presented in Table 7-1 below.

7-1: Nitrate Concentration in Groundwater (dated July 17, 2019)

Monitoring Well	Nitrate as N (mg/L)	ODWQS Standard (mg/L)
MW1	33.1	10
MW2	0.49	10
MW4	8.64	10

To verify the results of nitrate in groundwater, a re-sampling and testing of groundwater was completed on August 16, 2019. The groundwater samples were submitted to ALS laboratory for analysis of nitrate. The analytical results are provided in the Laboratory Certificate of Analysis in Appendix B, and are presented in the table below.

7-2: Nitrate Concentration in Groundwater (dated August 16, 2019)

Monitoring Well	Nitrate as N (mg/L)	ODWQS Standard (mg/L)
MW1	34.0	10
MW2	0.64	10
MW4	4.29	10

Based on the above, the analytical results for nitrate concentration analyzed by two (2) different labs appeared to be fairly consistent, and the exceedances of ODWQS Standard for nitrate were found in groundwater samples taken from MW1.

It is known that high nitrate concentrations are usually due to human activities, such as agriculture, industry, domestic effluents and emissions from combustion engines. Historically, the Site and the northwest adjacent property were used as farmlands. Therefore, the elevated nitrate concentration may be related to the past farming activities on Site and/or off-site such as application (likely overuse) of chemical fertilizer for the crops.

Also, it should be noted that MW1 is located in a low-lying area, where an ephemeral creek is located and accumulation of surface drainage is very possible near this location. In addition, given the presence of thick sand layer and deep groundwater table (about 10 mbgs) at MW1, infiltration of the accumulated water, together with oxidation of organic material contained in the water may take place, which would result in elevated nitrate concentration in this area.

It may be anticipated that the nitrate concentration would be low in the mid-portion of the Site, where high elevations are located.

8.0 WATER BALANCE

8.1 Site Level Water Balance

Based on the Thornthwaite and Mather methodology (1957), the water balance is an accounting of water in the hydrologic cycle. Precipitation (P) falls as rain and snow. It can run off towards lakes and streams (R), infiltrate to the groundwater table (I), or evaporate from ground or evapotranspiration by vegetation (ET). When long-term average values of P, R, I, and ET are used, there is minimal or no net change to groundwater storage (ΔS).

The annual water budget can be expressed as:

$$P = ET + R + I + \Delta S$$

Where:

P = Precipitation (mm/year)

ET = Evapotranspiration (mm/year)

R = Run-off (mm/year)

I = Infiltration (mm/year)

ΔS = Change in groundwater storage (taken as zero) (mm/year)

8.2 Climate Data

Monthly average temperature and precipitation data were obtained from Environment Canada, for Orangeville WPCP station (climate identifier: 6155790) as the nearest station located at about 8 km distance from the Property. Data was available between the years 1962 to 2006. Mean temporal variations of temperature and precipitation are shown in Figures 8-1 and 8-2.

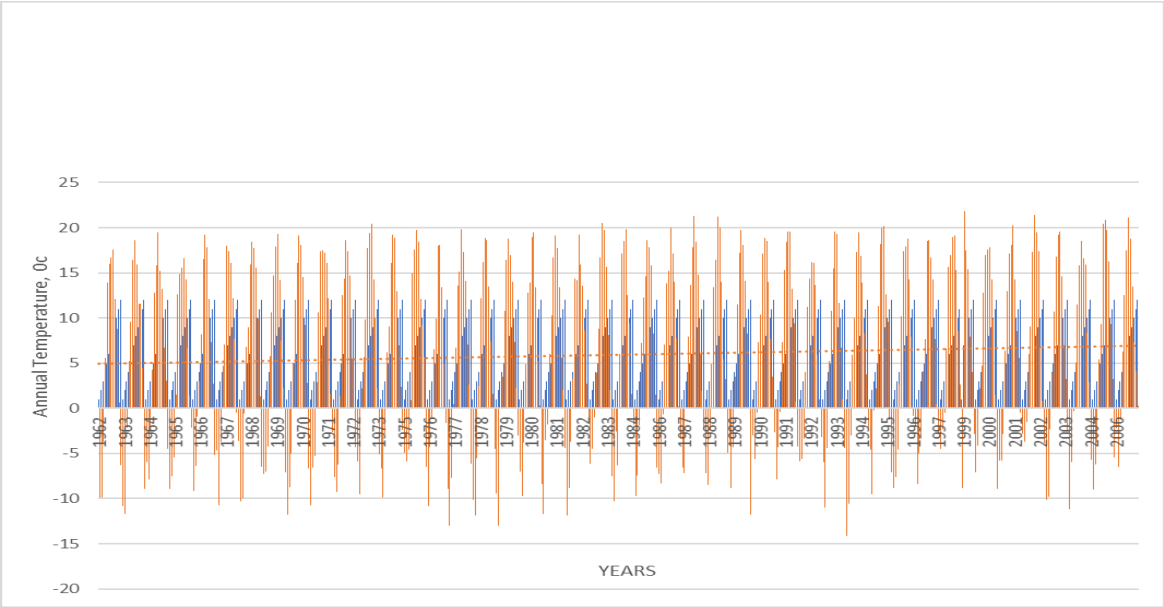


Figure 8-1: Mean Annual Temperature at the Site

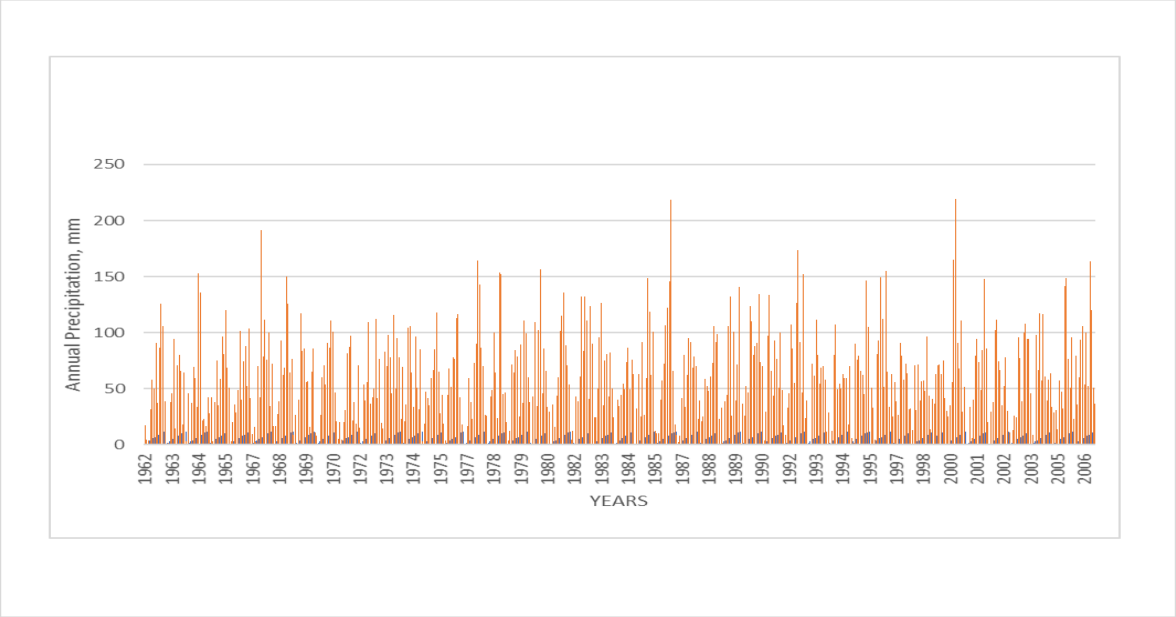


Figure 8-2: Mean Annual Precipitation at the Site

Average monthly variations of both temperature and precipitation were calculated for the period from 1962 to 2006 and is presented below in Figures 8-3 and 8-4, respectively. The highest temperature was recorded in the month of July, while the highest precipitation was in the month of August.

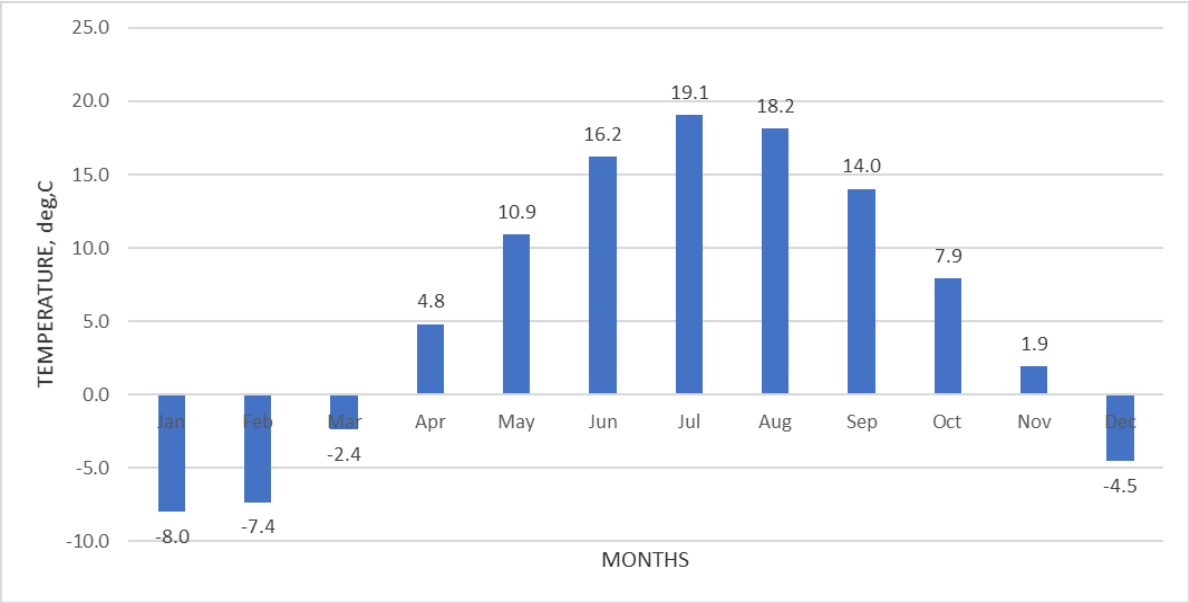


Figure 8-3: Average Monthly Temperature at the Site

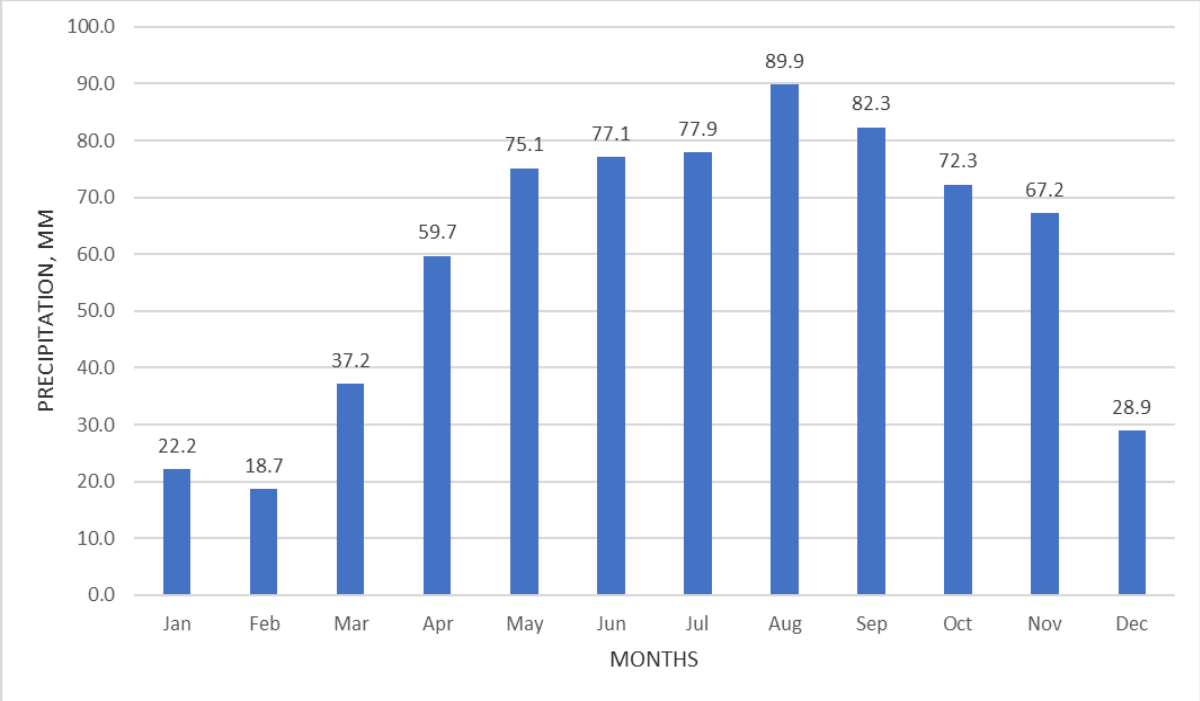


Figure 8-4: Average Monthly Precipitation at the Site

8.3 Infiltration and Runoff

Potential evapotranspiration was estimated to be about 529 mm/annum using the USGS Thornthwaite Monthly Water Balance software (Appendix D) utilizing average monthly temperature and precipitation results of Environment Canada, Orangeville weather station.

As mentioned above, given the potential evapotranspiration at 529 mm/annum and the average annual precipitation of 725 mm/annum, there is a net water surplus of 196 (=725-529) mm/annum occurring at the Site, which can either infiltrate into subsurface or go as run-off.

As a very conservative estimate of precipitation infiltration at the Subject Property, a value of 196 mm/year (say 0.2 m/year) was utilized for nitrate dilution calculations.

9.0 ASSESSMENT OF POTENTIAL NITRATE IMPACTS

In compliance with Town of Caledon Official Plan, potential nitrate impacts which are associated with the proposed development were assessed.

The impacts on local groundwater regime and down gradient property boundary are dependent upon the hydrogeology of the area, the background concentration of nitrate in the groundwater and contaminant concentration contained within the effluent.

9.1 Background Nitrate Concentration

As discussed in Section 7, nitrate was analyzed in groundwater samples taken from three (3) monitoring wells MW1, MW2 and MW4, and elevated nitrate concentrations were found at MW1. The elevated concentrations may have been caused due to the farming activities and/or due to the low-lying location. As a result, it would be anticipated that the nitrate concentration at the Site will be minimized after the residential development, when a channel is constructed as proposed and no farming activities will take place.

It should be noted that MW1 is located near the proposed channel area, which is outside the proposed eight (8) residential development lots. Therefore, the data obtained from MW1 will not be used as a background nitrate concentration.

Accordingly, the nitrate concentrations obtained from MW2 and MW4 during two rounds of sampling would be used for estimating the background nitrate concentration in the groundwater at the Subject Property, which was calculated to be 3.52 mg/L.

9.2 Nitrate Dilution Calculation – On-Site Impact Assessment

It should be noted that where municipal water and wastewater services are not available, all the proposed developments need to be self-sustaining on private individual water wells and private individual sewage disposal systems. As noted previously in the report, the source of the potable drinking water supply for the proposed residential development will be from the Palgrave municipal water supply wells.

The nitrate dilution calculations presented here are as per the methodology and procedures indicated in the Technical Guideline D-5 (Ministry of Environment, 1996) and the Ontario Building Code (Ministry of

Municipal Affairs and Housing, 2011, as amended) for development proposals involving private on-site servicing.

Based on the Site information, the following data was gathered and on-site nitrate impact assessment calculation was completed.

Site Information:

Number of Proposed lots (P)	8
Daily Effluent Flow /Lot (F)	1,000 L/day
Development Area (A)	11.117 ha
Infiltration Rate (Ir) (From water balance)	0.20 m/year
Nitrate Loading /Dwelling (N)	40 g/day
Impervious Surface (S)	assumed 20%

Calculations:

Step 1: Calculation of On-site Recharge (R)

= A x (1-S) x Ir + P x F

= 111,170 m² x (1-0.2) x (0.20 m/year) + (8 x 1,000 L/day)

= 17,787.2 m³/ year + 8,000 L/day

= 48,732 L/day + 8,000 L/day

= 56,732 L/day

Step 2: Calculation of Nitrate Loading (L)

= N x P

= 40 g/day x 8

= 320,000 mg/day

Step 3: Resultant Nitrate Concentration at Site Boundary

= L / R

= 320,000 mg/day / 56,732 L/day

= 5.64 mg/L

Based on the above calculations, a total load of 320,000 mg/day of nitrate will be added on the proposed development lots, which will result in an added concentration of 5.64 mg/L for nitrate in groundwater.

9.3 Nitrate Dilution – Application of Reasonable Use Policy

Reasonable Use Policy (RUP) is used to estimate the off-site nitrate impact assessment at the site boundary of the proposed development, based on RUP Guideline B-7 (MOE, 1996). The RUP dilution equation is as shown below. To be conservative on the nitrate dilution calculations, 80% of the total site

area (i.e., 122,800 x 0.8 m²) was used as water contributing area and the remaining as the impervious land.

$$C_{rup} = (Q_1 C_1 + Q_2 C_2) / Qt$$

Where,

Q_1 = contribution from 80% of property = total area (m^2) x infiltration (m/annum) (98,240 m² * 0.20 m/annum infiltration = 19,648 m^3/annum)

C_1 = background nitrate concentration, 3.52 mg/L

Q_2 = contribution from leaching beds = 8 lots * 1,000 L/d = 8,000 L/d (2,920 m^3/annum)

C_2 = septic effluent nitrate concentration = 40 mg/L (conservative for Class 4 treatment)

Qt = total offsite discharge = Q_1+Q_2

C_{rup} = nitrate concentration at down gradient property boundary (mg/L)

Using the above assumptions, the concentration of nitrate in the shallow groundwater system at the property boundary was estimated to be 8.24 mg/L, which is below the limit of 10 mg/L for nitrate set by the Ministry of the Environment, Conservation and Parks (MECP) reasonable use policy.

Therefore, the predicted concentration at the adjacent property boundary does not exceed 10 mg/L, indicating that the RUP guideline is met for the Subject Property. Although, RUP calculations are not typically applied to small sewage systems, the results of the RUP assessment are, however, for reference purpose.

Also, the RUP calculation does not take into consideration of biodegradation or denitrification in the subsurface and does not allow for plant uptake. This RUP calculation has considered dilution only, and thus, is very conservative in terms of overall conditions at the Subject Property.

10.0 CONCLUSIONS AND RECOMMENDATIONS

This report was prepared by SIRATI in support of a proposed development at 0 Mount Pleasant Road, Town of Caledon, Ontario.

Based on the information obtained from previous investigations and the results of nitrate impact assessment conducted at the Subject Property, the following findings or conclusions can be presented:

- The Subject Property falls within the Beeton Creek secondary watershed of Innisfil Creek subwatershed of Nottawasaga Valley Watershed, under the jurisdiction of Nottawasaga Valley Conservation Authority (NVCA).
- The topography of the Site presents elevated locations or a drainage divide located in the mid-portion of the Site.

- The soil stratigraphy of the Site generally consisted of topsoil with or without fill materials, underlain by native soils of sand, and then by silty sand, silt and sand or sandy silt, locally with silt or clayey silt to silty clay.
- Groundwater levels monitored in five (5) existing monitoring wells (BH/MW1, BH/MW2, BH/MW4, BH/MW6 & BH/MW8) ranged from 4.41 mbgs and 10.30 mbgs, with the highest groundwater measured in MW6 located in the mid-portion of the Site.
- Groundwater flow was inferred to be divergent in the mid-portion of the Site, generally following the surficial topography of the Site.
- Water balance analysis indicated a water surplus of 196 mm/year (or about 0.2 m/year) in the site area, which can either infiltrate into subsurface or go as run-off.
- Groundwater quality assessment indicated that groundwater samples may not meet the Ontario Drinking Water Quality Standards (ODWQS) due to the elevated concentrations of aluminum, iron, manganese, total hardness and turbidity and/or nitrate.
- Elevated concentrations or exceedances of nitrate were detected in one (1) monitoring well (MW1) located in a low-lying area near an ephemeral creek, which may be due to the past farming activities or as a result of oxidation of accumulated organic material in groundwater. The background concentration of nitrate in the groundwater was calculated to be 3.52 mg/L, which is below the ODWQS of 10 mg/L for nitrate.
- As the proposed development is based on the private septic systems for the proposed eight (8) residential lots, a concentration of 5.64 mg/L of nitrate is anticipated to be added into the groundwater system in the area of the development lots.
- Reasonable Use Policy (RUP) was used to assess the off-site nitrate impact associated with the proposed residential development, and the estimated or predicted nitrate concentration at the property boundary is 8.24 mg/L, which meets Ministry of the Environment, Conservation and Parks (MECP) reasonable use policy (RUP) guideline of 10 mg/L for nitrate.
- The results of nitrate impact assessment support the proposed residential subdivision plan with eight (8) lots, as no impacts due to the development are anticipated at this time.

SELECTED BIBLIOGRAPHY

Johnson, M.D., Armstrong, D.K., Sanford, B.V., Telford, P.G. and Rutka, M.A., 1992. Paleozoic and Mesozoic geology of Ontario; *in* Geology of Ontario, Ontario Geological Survey, Special Volume 4, Part 2, p.907-1008.

Ministry of Natural Resources, Ontario Geologic Survey, 1984, The Physiography of Southern Ontario, Third Edition, L. J. Chapman and D. F. Putnam

MMAH, 1997. Ontario Building Code, Part 8 – Sewage Systems. Ont. Reg. 403/97 made under the Building Code Act, 1992. As amended from time to time.

Ministry of the Environment, 1982. Manual of Policy, Procedures and Guidelines for Onsite Sewage Systems. Queen's Printer for Ontario, ISBN 0-7743-7303.

Ministry of the Environment, 1996. Procedure D-5-4 – Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Assessment.

Ministry of the Environment, 1997. Ontario Building Code. Sewage System Design Flows. Table 8.2.1.3.A. Residential Occupancy

Ministry of the Environment, 2008. Design Guideline for Sewage Works. PIBS6879

Ontario Geological Survey 1991. Bedrock geology of Ontario, southern sheet; Ontario Geological Survey, Map 2544, scale 1: 1 000 000.

Thornthwaite, C.W., and Mather, J.R., 1957 Instructions and tables for computing potential evapotranspiration and the water balance. Climatology, vol. X, #3.

Freeze, R. A. and Cherry, J. A., 1979, Groundwater, Prentice-Hall, Englewood Cliffs, New Jersey

Sirati & Partners Consultants Ltd., Report on Hydrogeological Impact Study, 0 Mt. pleasant Road, Town of Caledon, Ontario, May 18, 2018.

LIMITATIONS AND USE OF THE REPORT

This report was produced for the sole use of Tropical Land Developments Limited, c/o David Goodman (the Client) for the property located at 0 Mount Pleasant Road, Town of Caledon, Ontario and may not be relied upon by any other person or entity without the written authorization of Sirati & Partners Consultants Limited (SIRATI).The conclusions presented in this report are professional opinions based on the historical and current records search, visual observations and limited information provided by persons knowledgeable about past and current activities on this site. As such, SIRATI cannot be held responsible for environmental conditions at the Property that was not apparent from the available information. No investigation method can completely eliminate the possibility of obtaining partially imprecise or incomplete information; it can only reduce the possibility to an acceptable level.

Professional judgement was exercised in gathering and analyzing data and formulation of recommendations using current industry guidelines and standards. Similar to all professional persons rendering advice, SIRATI cannot act as absolute insurer of the conclusion we have reached. No additional warranty or representation, expressed or implied, is included or intended in this report other than stated herein the report.

The assessment should not be considered a comprehensive audit that eliminates all risks of encountering environmental problems. The information presented herein this report is primarily based on information collected during the hydrogeological study based on the condition of the Property at the time of site inspection/drilling followed by a review of historical data, as appended to this report.

In assessing the environmental setting of the Property, SIRATI has solely relied upon information supplied by others in good faith and has therefore assumed that the information supplied is factual and accurate. We accept no responsibility for any inaccurate information, misrepresentation or for any deficiency of the information supplied by any third party.

The scope of services performed in the execution of this investigation may not be appropriate to satisfy third parties. SIRATI accepts no responsibility for damages if any, suffered by any third party as a result of decisions made or action taken based on this report. Any use, copying or distribution of the report in whole or in part is not permitted without the express written permission of SIRATI and use of findings, conclusions and recommendations represented in this report, is at the sole risk of third parties.

In the event that during future work new information regarding the environmental condition of the Property is encountered, or in the event that the outstanding responses from the regulatory agencies indicate outstanding issues on file with respect to the Property, SIRATI should be notified in order that we may re-evaluate the findings of this assessment and provide amendments, as required.

Should you have any questions regarding the information presented or limitation set in this report, please do not hesitate to contact our office.

Yours truly,

Sirati and Partners Consultants Limited

Sudhakar Kurli, M.Sc., P. Geo.
Hydrogeologist/Project Manager

Bujing Guan, M. A.Sc., P. Geo.
Senior Hydrogeologist/Environmental Specialist

FIGURES

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions

Source: Map Data © 2018 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

Property Boundary

Project Title:
Nitrate Impact Assessment

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

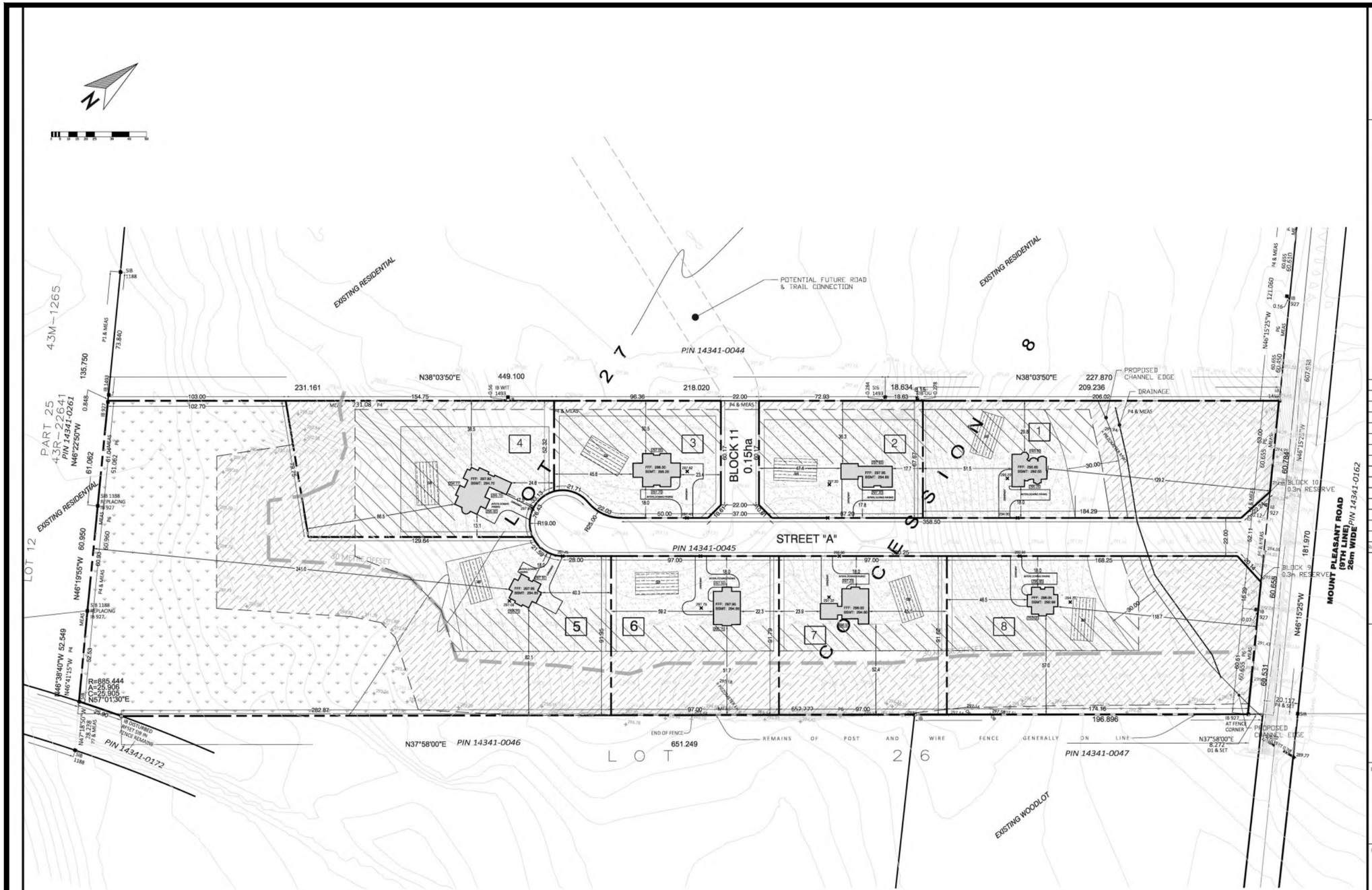
Figure Title:
Site Location Plan

Scale: 0m 100m 200m

Project Number: SP17-212-30

Date: September 2019

Figure Number: 1-1



SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

Property Boundary

Project Title

0 MOUNT PLEASANT ROAD, CALEDON
TROPICAL LAND DEVELOPMENT LTD.

Location
MOUNT PLEASANT ROAD-CALEDON

Drawing Title
SITE PLAN

Scale	1:1000	Date	October 3, 2017
Drawn By	C.K./S.R	Checked By	F.C
Project No.	201711	Drawing No.	A-101

Project Title:

Nitrate Impact Assessment

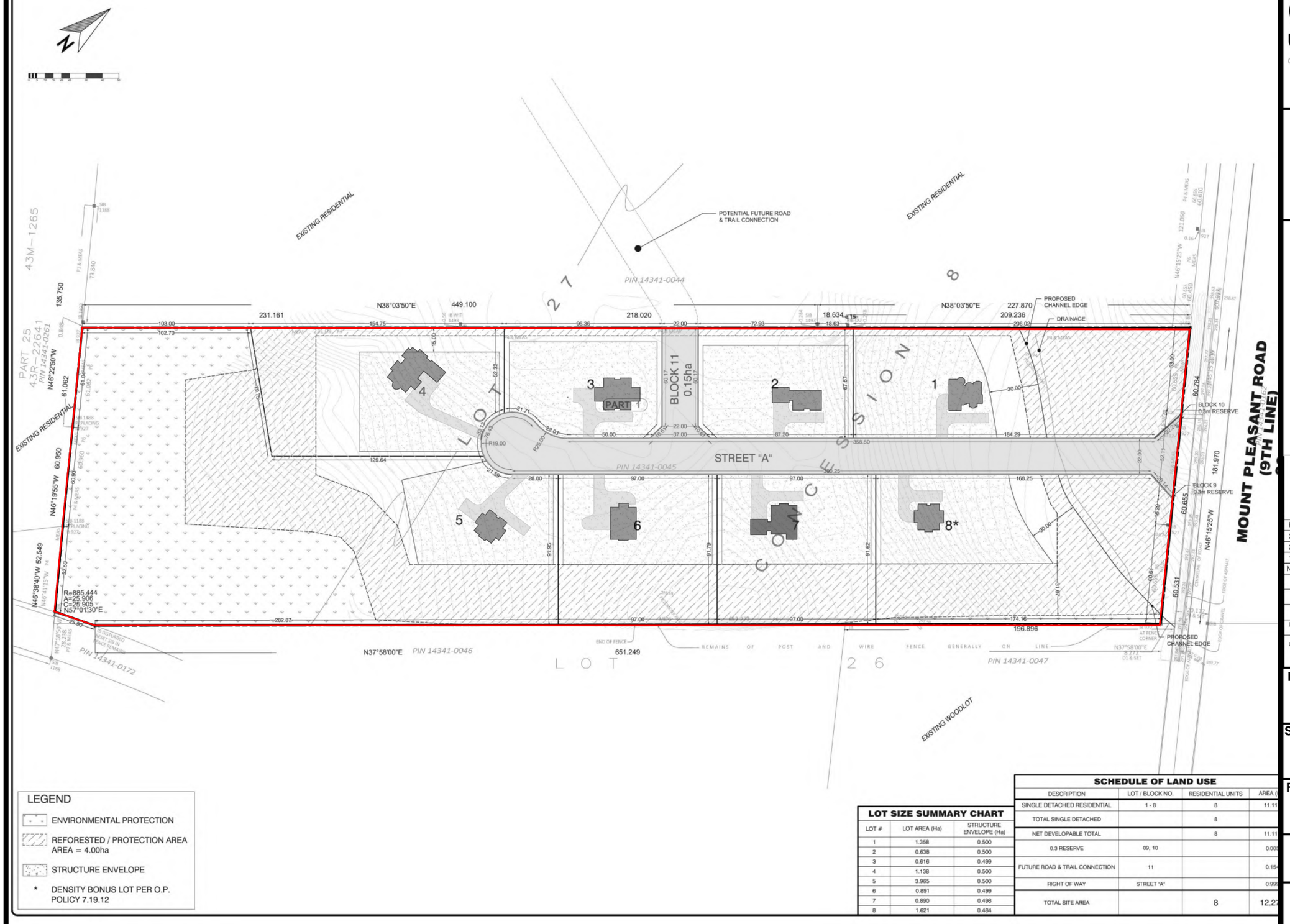
Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

Site Development Plan

Scale:	Project Number:
0m 50m	SP17-212-30
Date: September 2019	**Figure Number:** 3-1



LEGEND

- ENVIRONMENTAL PROTECTION
- REFORESTED / PROTECTION AREA AREA = 4.00ha
- STRUCTURE ENVELOPE
- * DENSITY BONUS LOT PER O.P. POLICY 7.19.12

LOT SIZE SUMMARY CHART

LOT #	LOT AREA (Ha)	STRUCTURE ENVELOPE (Ha)
1	1.358	0.500
2	0.638	0.500
3	0.616	0.499
4	1.138	0.500
5	3.965	0.500
6	0.891	0.499
7	0.890	0.498
8	1.621	0.484

SCHEDULE OF LAND USE

DESCRIPTION	LOT / BLOCK NO.	RESIDENTIAL UNITS	AREA (Ha)
SINGLE DETACHED RESIDENTIAL	1 - 8	8	11.11
TOTAL SINGLE DETACHED		8	
NET DEVELOPABLE TOTAL		8	11.11
0.3 RESERVE	09, 10		0.005
FUTURE ROAD & TRAIL CONNECTION	11		0.154
RIGHT OF WAY	STREET "A"		0.995
TOTAL SITE AREA		8	12.27

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

Property Boundary

TROPICAL LAND DEVELOPMENT LTD.

No.	Description	Date	Int.
REVISIONS			
3			
2			
1	REVISION	6/12/19	JS

PROJECT No.: 17445
DATE: May 4, 2018
SCALE: 1:1000
DRAFTED BY: JS
CHECKED BY: MJ
DRAWING No.: **DP-01**

Project Title:

Nitrate Impact Assessment

Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

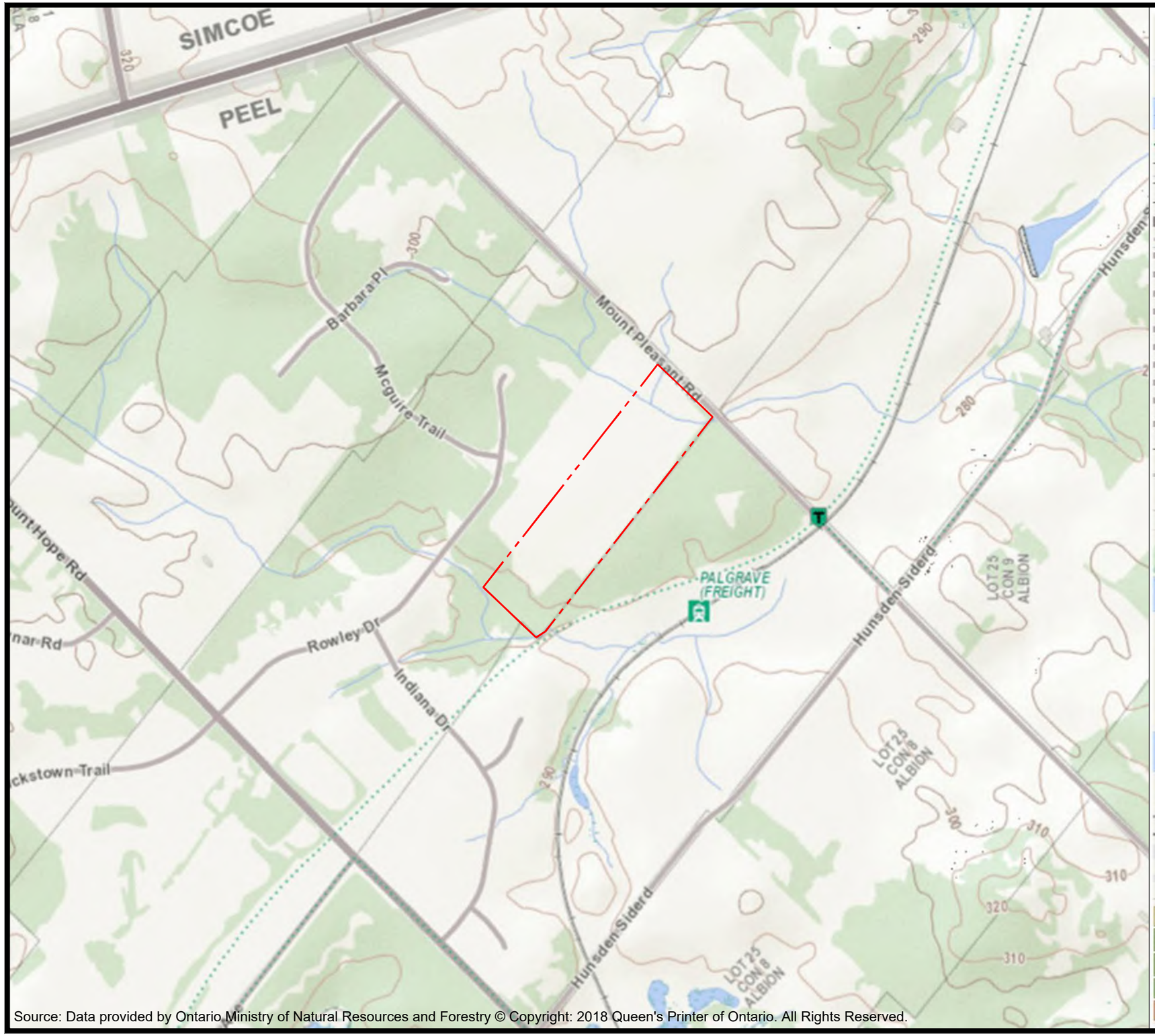
Site Grading Plan

Scale: 0m 50m

Project Number: SP17-212-30

Date: September 2019

Figure Number: 3-2



- Building as Symbol
- Building to Scale
- Airport
- Heliport \ Hospital Heliport
- Seaplane Base
- Ferry Route
- Trail Head \ Trail
- Railway \ Train Station
- Railway with Bridge
- Railway with Tunnel
- Road (Major → Minor)
- Winter Road
- Road with Bridge
- Road with Tunnel
- Primary, Kings or 400 Series Highway
- Secondary Highway
- Tertiary Highway
- District, County, Regional or Municipal Road
- Toll Highway
- One Way Road
- Road with Permanent Blocked Passage
- Road with Address Ranges (420 500 / 421 499)
- Hydro Line, Communication Line or Unknown Transmission Line
- Natural Gas Pipeline, Water Pipeline or Unknown Pipeline
- Spot Height (208)
- Index Contour (200)
- Contour
- Wooded Area
- Wetland
- Waterbody
- Waterbody Elevation (184)
- Watercourse
- Falls
- Rapids
- Rapids \ Falls
- Rapids
- Rocks
- Lock Gate
- Dam \ Hydro Wall
- Dam \ Hydro Wall
- Provincial \ State Boundary
- International Boundary
- Upper Tier \ District Municipal Boundary
- Lower Tier \ Single Tier Municipal Boundary
- Lot Line
- Indian Reserve
- Provincial Park
- National Park
- Conservation Reserve
- Military Lands

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

Property Boundary

Project Title:
Nitrate Impact Assessment

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

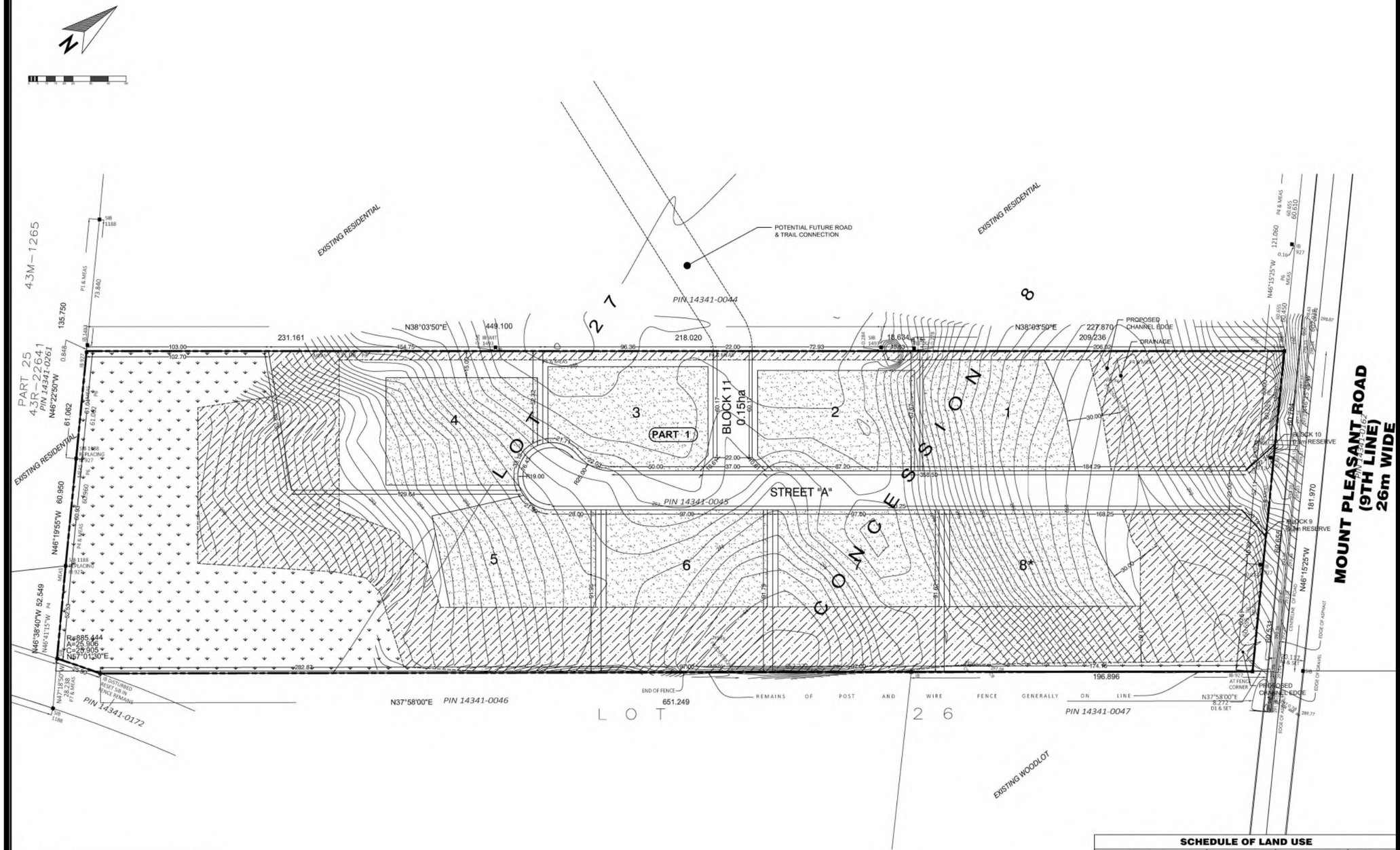
Figure Title:
Regional Topographic Map

Scale: 0m 100m 200m

Project Number: SP17-212-30

Date: September 2019

Figure Number: 4-1



LEGEND

- ENVIRONMENTAL PROTECTION
- REFORESTED / PROTECTION AREA AREA = 4.00ha
- STRUCTURE ENVELOPE
- * DENSITY BONUS LOT PER O.P. POLICY 7.19.12

LOT SIZE SUMMARY CHART

LOT #	LOT AREA (Ha)	STRUCTURE ENVELOPE (Ha)
1	1.358	0.500
2	0.638	0.500
3	0.616	0.499
4	1.138	0.500
5	3.965	0.500
6	0.891	0.499
7	0.890	0.498
8	1.621	0.484

SCHEDULE OF LAND USE

DESCRIPTION	LOT / BLOCK NO.	RESIDENTIAL UNITS	AREA (ha.)
SINGLE DETACHED RESIDENTIAL	1 - 8	8	11.117
TOTAL SINGLE DETACHED		8	
NET DEVELOPABLE TOTAL		8	11.117
0.3 RESERVE	09, 10		0.005
FUTURE ROAD & TRAIL CONNECTION	11		0.154
RIGHT OF WAY	STREET "A"		0.999
TOTAL SITE AREA		8	12.275

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

Property Boundary

TROPICAL LAND DEVELOPMENT LTD.

REVISIONS			
3			
2			
1	REVISION	6/12/19	JS
No.	Description	Date	Int.

PROJECT No.: 17445
DATE: May 4, 2018
SCALE: 1:1000
DRAFTED BY: JS
CHECKED BY: MJ
DRAWING No.: **DP-01**

Project Title:

Nitrate Impact Assessment

Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

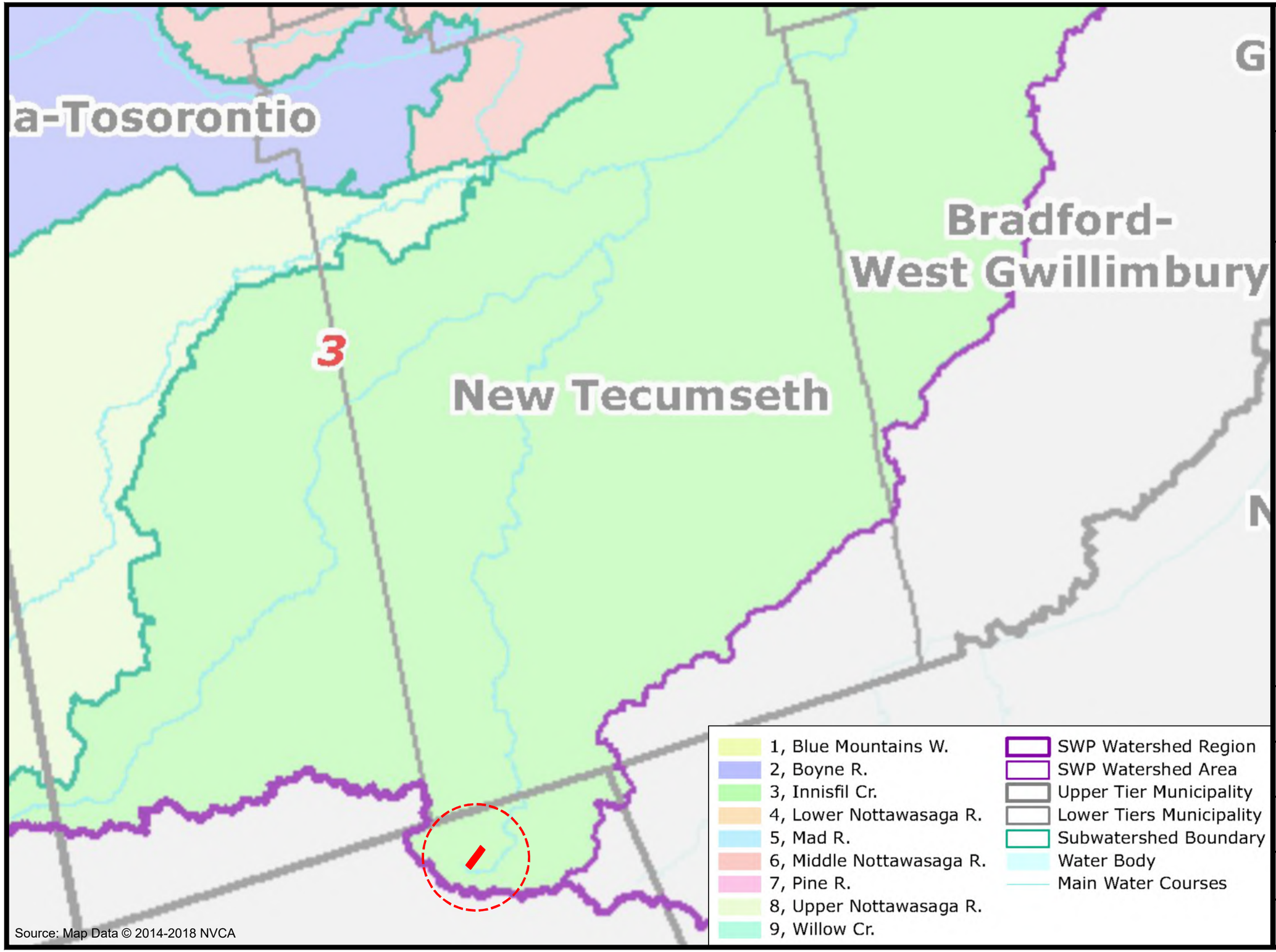
Site Topographic Survey Map

Scale: 0m 50m

Project Number: SP17-212-30

Date: September 2019

Figure Number: 4-2



SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

Subject Site

Approximate Site Location

Project Title:
Nitrate Impact Assessment

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

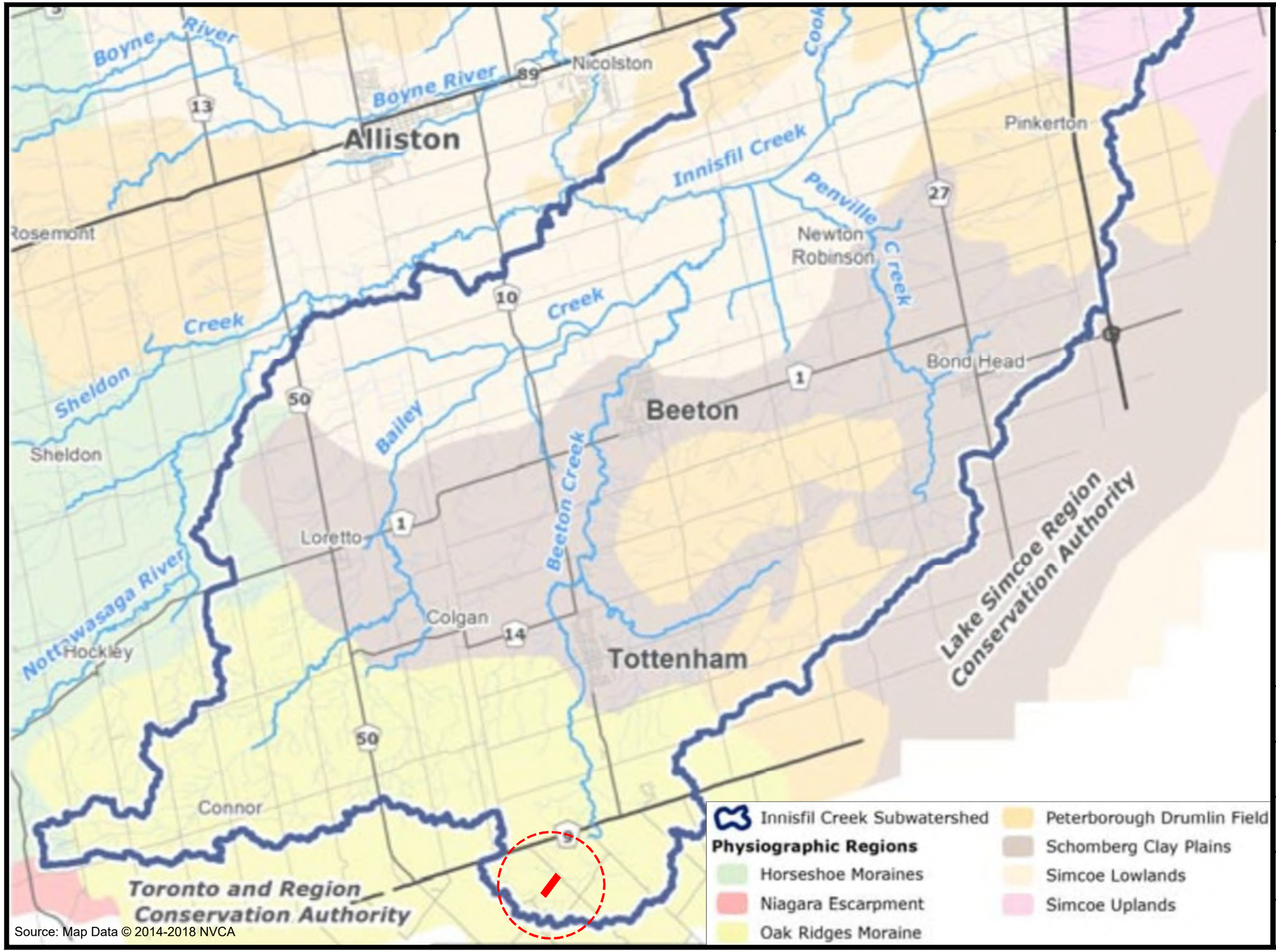
Figure Title:
Innisfil Creek Watershed Map

Scale: 0m 1km 2km

Project Number: SP17-212-30

Date: September 2019

Figure Number: 4-3



Source: Map Data © 2014-2018 NVCA

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

Subject Site

Approximate Site Location

Project Title:
Nitrate Impact Assessment

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
Physiography Map

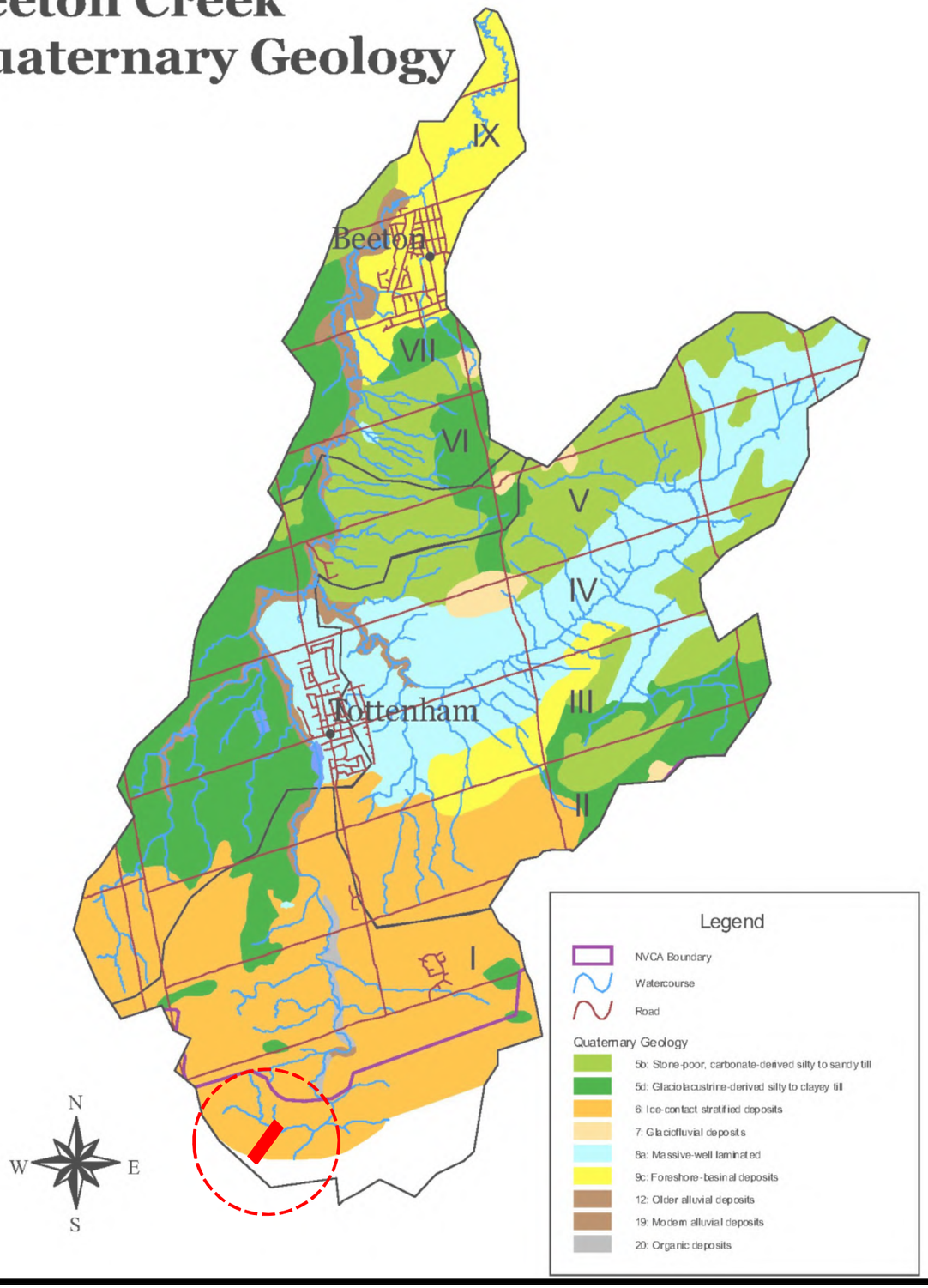
Scale: 0m 1km 2km

Project Number: SP17-212-30

Date: September 2019

Figure Number: 4-4

Beeton Creek
Quaternary Geology



Source: Map Data © 2014-2018 NVCA

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

Subject Site

Approximate Site Location

Project Title:
Nitrate Impact Assessment

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

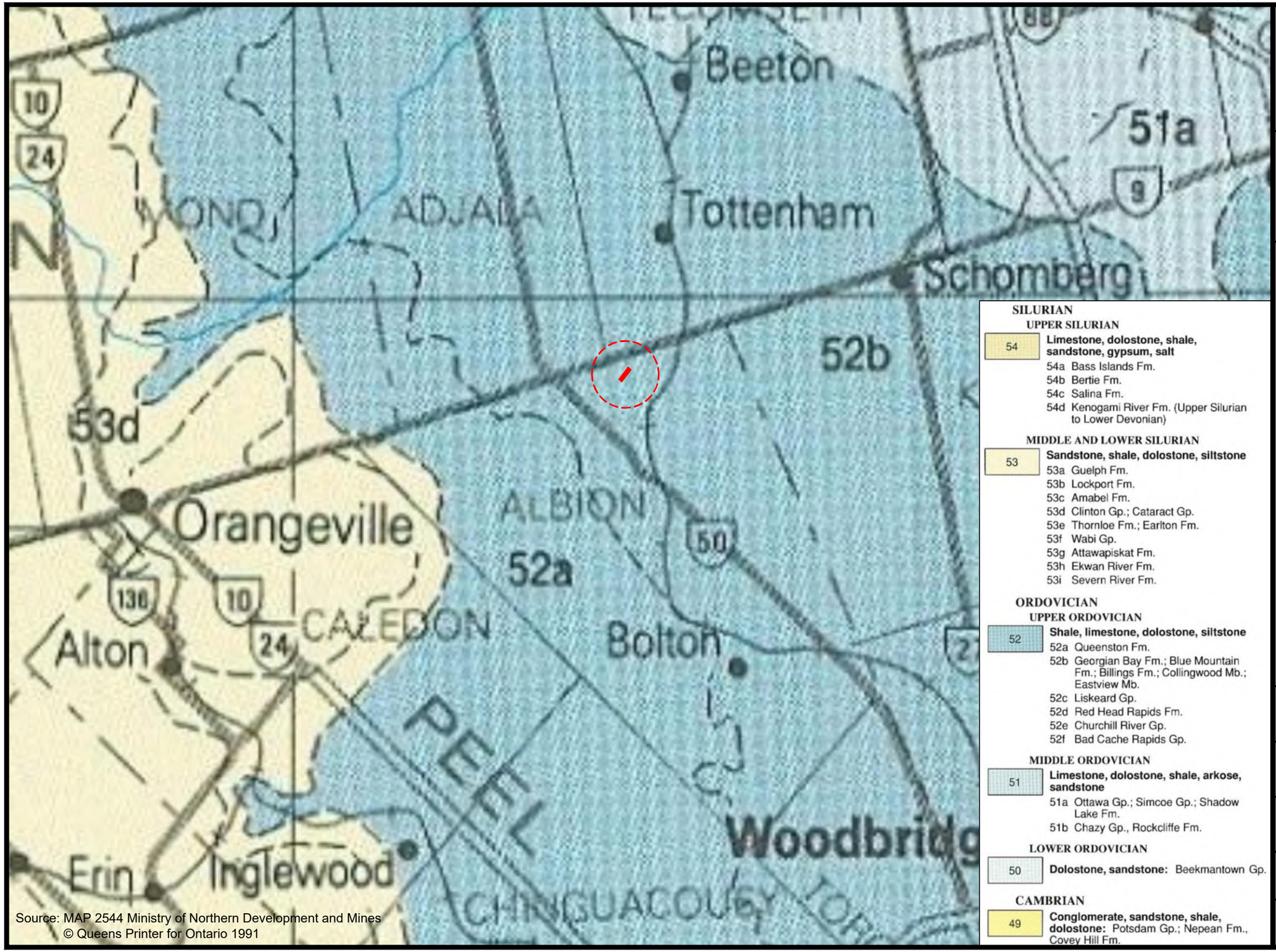
Figure Title:
Surficial Geology Map

Scale: 0m 500m

Project Number: SP17-212-30

Date: September 2019

Figure Number: 4-5



Source: MAP 2544 Ministry of Northern Development and Mines
© Queens Printer for Ontario 1991

SILURIAN

UPPER SILURIAN

54 **Limestone, dolostone, shale, sandstone, gypsum, salt**
- 54a Bass Islands Fm.
- 54b Bertie Fm.
- 54c Salina Fm.
- 54d Kenogami River Fm. (Upper Silurian to Lower Devonian)

MIDDLE AND LOWER SILURIAN

53 **Sandstone, shale, dolostone, siltstone**
- 53a Guelph Fm.
- 53b Lockport Fm.
- 53c Amabel Fm.
- 53d Clinton Gp.; Cataract Gp.
- 53e Thornloe Fm.; Earlton Fm.
- 53f Wabi Gp.
- 53g Attawapiskat Fm.
- 53h Ekwan River Fm.
- 53i Severn River Fm.

ORDOVICIAN

UPPER ORDOVICIAN

52 **Shale, limestone, dolostone, siltstone**
- 52a Queenston Fm.
- 52b Georgian Bay Fm.; Blue Mountain Fm.; Billings Fm.; Collingwood Mb.; Eastview Mb.
- 52c Liskeard Gp.
- 52d Red Head Rapids Fm.
- 52e Churchill River Gp.
- 52f Bad Cache Rapids Gp.

MIDDLE ORDOVICIAN

51 **Limestone, dolostone, shale, arkose, sandstone**
- 51a Ottawa Gp.; Simcoe Gp.; Shadow Lake Fm.
- 51b Chazy Gp., Rockcliffe Fm.

LOWER ORDOVICIAN

50 **Dolostone, sandstone:** Beekmantown Gp.

CAMBRIAN

49 **Conglomerate, sandstone, shale, dolostone:** Potsdam Gp.; Nepean Fm., Covey Hill Fm.

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

Subject Site

Approximate Site Location

Project Title:
Nitrate Impact Assessment

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

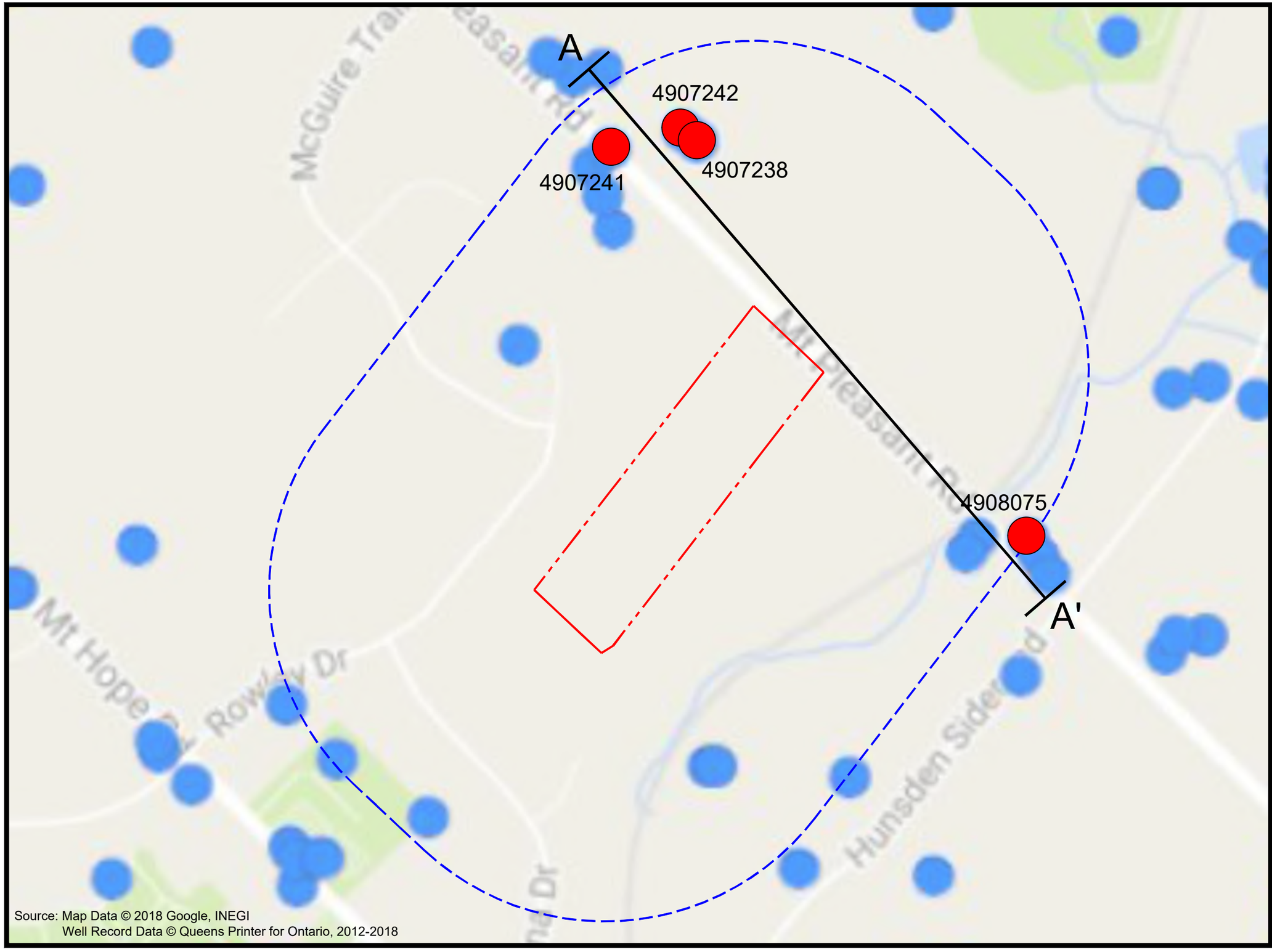
Figure Title:
Bedrock Geology Map

Scale: 0m 2km 4km

Project Number: SP17-212-30

Date: September 2019

Figure Number: 4-6



Source: Map Data © 2018 Google, INEGI
Well Record Data © Queens Printer for Ontario, 2012-2018

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

Property Boundary

500 m Study Area

Project Title:
Nitrate Impact Assessment

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

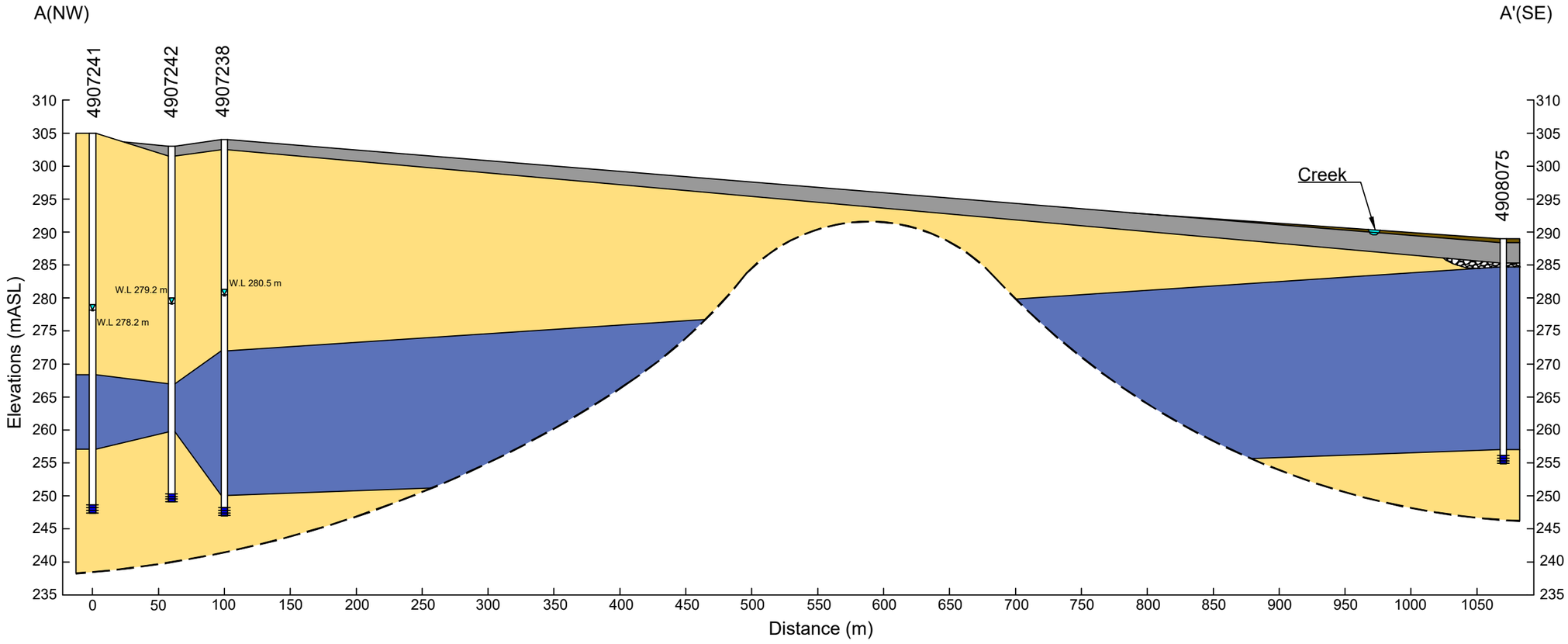
Figure Title:
MECP Well Record Map

Scale: 0m 100m 200m

Project Number: SP17-212-30

Date: September 2019

Figure Number: 5-1



SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

- Top Soil
- Sand
- Clay
- Silt
- Gravel

1234567
- Borehole / Well ID
- Water Level
- Well Screen

Project Title:

Nitrate Impact Assessment

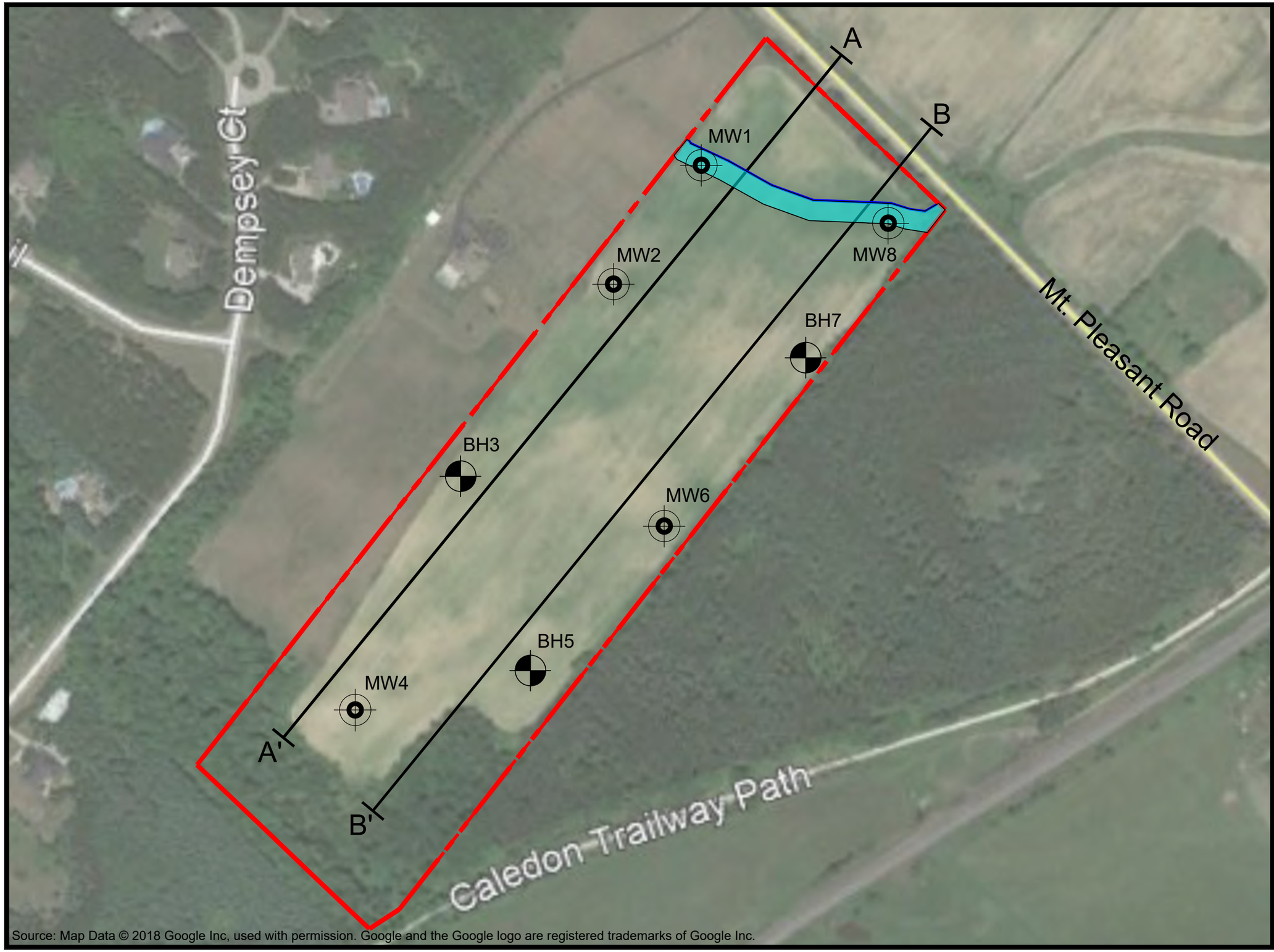
Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

Hydrogeologic Cross Section a/c MECP Well Records

Scale:	Project Number:
As Shown	SP17-212 -00
Date:	**Figure Number:**
September 2019	5-2



Source: Map Data © 2018 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

N

Legend:

- Property Boundary
- Creek
- Creek Buffer
- Monitoring Well
- Borehole

Project Title:

Nitrate Impact Assessment

Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

SIRATI Borehole / Monitoring Well Location Map

Scale:

0m 30m 60m

Project Number:

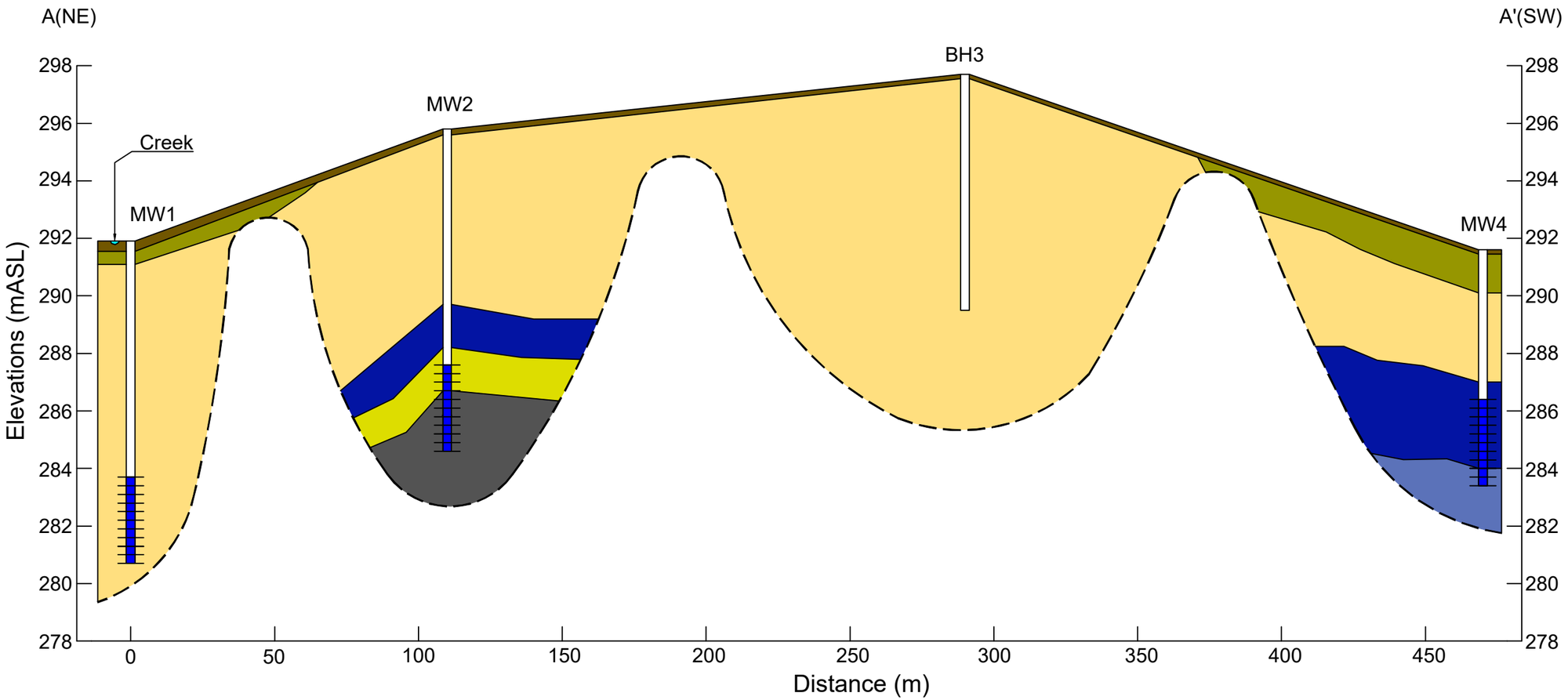
SP17-212-00

Date:

September 2019

Figure Number:

6-1



SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

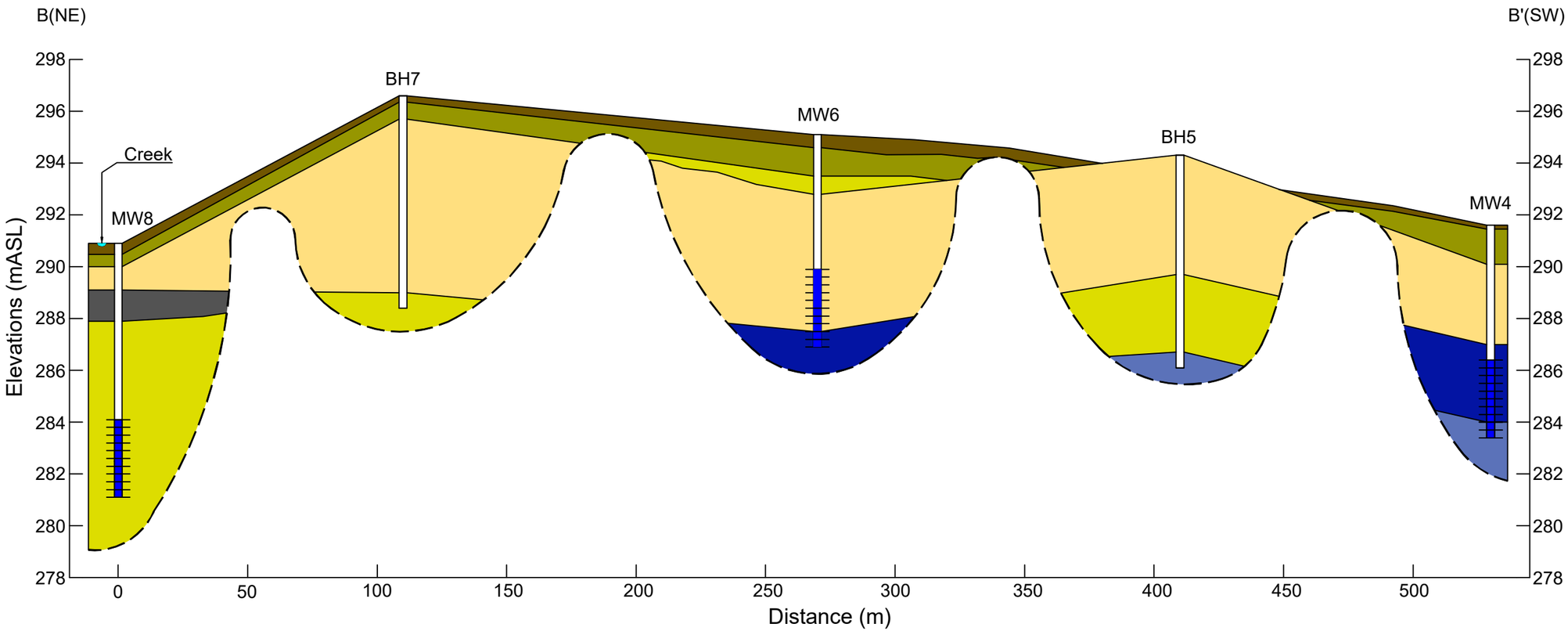
- Top Soil
- Fill
- Sand
- Silty Sand
- Clayey Silt / Silty Clay
- Sandy Silt
- Silt
- MW1 — Borehole / Well ID
- Water Level
- Well Screen

Project Title:
Nitrate Impact Assessment

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
Cross Section a/c SIRATI Boreholes
MW1, MW2, BH3 and MW4 – A-A'

Scale:	Project Number:
As Shown	SP17-212-00
Date:	**Figure Number:**
September 2019	6-2



SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

- Top Soil
- Fill
- Sand
- Silty Sand
- Clayey Silt / Silty Clay
- Sandy Silt
- Silt
- MW1 ← Borehole / Well ID
- Water Level
- Well Screen

Project Title:
Nitrate Impact Assessment

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
Cross Section a/c SIRATI Boreholes
MW4, BH5, MW6, BH7 and MW8 - B-B'

Scale:	Project Number:
As Shown	SP17-212-00
Date:	**Figure Number:**
September 2019	6-3

Source: Map Data © 2018 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

Legend:

- Contour Line
- Inferred Groundwater Flow Direction
- 188.0 mASL — Monitoring Well & Groundwater Elevation

Project Title:
Nitrate Impact Assessment

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
Inferred Groundwater Table Contour Map
March 2018

Scale: 0m 30m 60m

Project Number: SP17-212-00

Date: September 2019

Figure Number: 6-4

APPENDICES

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

APPENDIX A

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH1

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: Tropical Land Developments Limited
PROJECT LOCATION: Mt Pleasent Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Figure 6-1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/02/2017

REF. NO.: SP17-212-10
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
291.9												
0.0 / 291.6	**TOPSOIL:** 350mm		1	SS	7							
0.4 / 291.1	**FILL:** silty sand, trace clay, trace rootlets, brown, moist, loose											
1 0.8	**SAND:** trace silt, trace gravel, brown, moist, very loose		2	SS	3		291					
			3	SS	2		290					
2			4	SS	2							
3			5	SS	4		289					0 96 2 2
4							288					
			6	SS	2							
5							287					
6	compact below 6.1m		7	SS	12		286					
7							285					
8			8	SS	22		284					
9	very moist to wet below 9.1m		9	SS	17		283					
10						W. L. 282.1 m Jun 16, 2017						
11 280.7			10	SS	17		281					
11.2	**END OF BOREHOLE** Notes: 1) Monitoring well installed in the borehole upon completion. 2) Water level in monitoring well at 9.8m on June 16, 2017.											

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH2

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: Tropical Land Developments Limited
PROJECT LOCATION: Mt Pleasant Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Figure 6-1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/01/2017

REF. NO.: SP17-212-10
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
295.8												
295.6	**TOPSOIL:** 200mm											
0.2	**SAND:** trace silt, trace gravel, brown, moist, loose to compact		1	SS	6				○			
			2	SS	18		295		○			
			3	SS	21		294		○			
			4	SS	16		293		○			
	occasional silt seams at 3m		5	SS	20				○			
			6	SS	26		292		○			
289.7							291					
6.1	**SILT TO SANDY SILT:** trace clay, trace gravel, grey, wet, compact		7	SS	20		290		○			0 10 66 24
288.2							289					
7.6	**SILTY SAND:** trace clay, brown, wet, compact		8	SS	29		288		○			
286.7							287					
9.1	**CLAYEY SILT TO SILTY CLAY:** trace sand, occasional sand seams, greyish brown, wet, stiff		9	SS	9	▽			○			
								W. L. 286.2 m Jun 16, 2017				
			10	SS	13		285		○			
284.6												
11.2	**END OF BOREHOLE** Notes: 1) Monitoring well installed in the borehole upon completion. 2) Water level in monitoring well at 9.6m on June 16, 2017.											

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

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

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

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH3

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: Tropical Land Developments Limited
PROJECT LOCATION: Mt Pleasant Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Figure 6-1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/01/2017

REF. NO.: SP17-212-10
ENCL NO.: 4

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"							
297.7												
297.6	**TOPSOIL:** 150mm											
0.2	**SAND:** weathered/disturbed, trace silt, brown, moist, loose		1	SS	6							
296.9							297					
1 0.8	**SAND:** trace silt, brown, moist, compact		2	SS	12							
	occasional silt seams at 1.5m		3	SS	23		296					
2			4	SS	27							
3			5	SS	24		295					
4			6	SS	25		294					
5			7	SS	25		293					
6							292					
7							291					
8			8	SS	26		290					
289.5												
8.2	**END OF BOREHOLE** Notes: 1) Borehole dry on completion.											

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH4

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: Tropical Land Developments Limited
PROJECT LOCATION: Mt Pleasant Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Figure 6-1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/01/2017

REF. NO.: SP17-212-10
ENCL NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
291.6							
291.6	**TOPSOIL:** 150mm						
0.2	**FILL:** silty sand, trace topsoil, dark brown, moist, very loose		1	SS	4		291
1			2	SS	3		
290.1							290
1.5	**SAND:** some silt, brown, moist, compact		3	SS	17		
2			4	SS	26		289
3			5	SS	21		
287.0							288
4.6	**SANDY SILT:** trace clay, trace gravel, grey, wet, compact		6	SS	19	▽	287
5							W. L. 286.9 m Jun 16, 2017
6							286
6			7	SS	16		
7							285
284.0							
7.6	**SILT:** trace sand, grey, wet, compact		8	SS	19		284
8							
283.4							
8.2	**END OF BOREHOLE**						

Notes:
1) Monitoring well installed in the borehole upon completion.
2) Water level in monitoring well at 4.7m on June 16, 2017.

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

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

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

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH5

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: Tropical Land Developments Limited
PROJECT LOCATION: Mt Pleasant Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Figure 6-1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/01/2017

REF. NO.: SP17-212-10
ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
294.3												
0.0	**SAND:** trace silt, trace gravel, brown, moist, loose to compact		1	SS	7		294					
			2	SS	6							
							293					
			3	SS	9							
							292					
			4	SS	11							
			5	SS	13		291					
							290					
289.7												
4.6	**SANDY SILT TO SILTY SAND:** trace clay, greyish brown, moist to wet, compact		6	SS	25							0 23 65 12
							289					
			7	SS	22		288					
							287					
286.7												
7.6	**INTERBEDED SAND AND SILT:** trace clay, brown, moist, dense		8	SS	35							
286.1												
8.2	**END OF BOREHOLE** Notes: 1) Borehole open and dry on completion.											

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH6

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: Tropical Land Developments Limited
PROJECT LOCATION: Mt Pleasant Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Figure 6-1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/01/2017

REF. NO.: SP17-212-10
ENCL NO.: 7

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
295.1					
0.0 / 294.6	**TOPSOIL:** 500mm	1	SS	5	295
0.5 / 294.3	**FILL:** sandy silt, trace topsoil, brown, moist, loose				
1 0.8 / 293.5	**POSSIBLE FILL:** sand, trace silt, brown, moist, very loose	2	SS	2	294
1.6 / 292.8	**SILTY SAND:** trace clay, brown, moist, very loose	3	SS	4	293
2.3	**SAND:** trace silt, trace gravel, occasional silt layers, brown to greyish brown, moist to very moist, compact to dense	4	SS	25	
3		5	SS	27	292
4		6	SS	34	291
5					290
6		7	SS	41	289
7 / 287.5					288
7.6 / 286.9	**SILT TO SANDY SILT:** trace clay, grey, moist, compact	8	SS	28	287
8.2	**END OF BOREHOLE**				

Notes:
1) Monitoring well installed in the borehole upon completion.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

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

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

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH7

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: Tropical Land Developments Limited
PROJECT LOCATION: Mt Pleasant Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Figure 6-1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/02/2017

REF. NO.: SP17-212-10
ENCL NO.: 8

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
296.6 / 0.0	**TOPSOIL:** 250mm						
296.4 / 0.3	**FILL:** sand, some silt, brown, moist, loose		1	SS	6		
295.8 / 0.9	**FILL:** sandy silt to silty sand mixed with topsoil, brown, moist, compact		2	SS	15		296
	SAND: trace silt, trace gravel, brown to greyish brown, moist, compact		3	SS	18		295
			4	SS	22		294
			5	SS	33		293
			6	SS	21		292
			7	SS	22		291
289.0 / 7.6	**SILTY FINE SAND:** trace clay, layer of silt, brown, wet, compact		8	SS	21		290
288.4 / 8.2	**END OF BOREHOLE**						289

Notes:
1) Borehole open and water level at 7.8m during drilling.

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH8

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: Tropical Land Developments Limited
PROJECT LOCATION: Mt Pleasant Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Figure 6-1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/02/2017

REF. NO.: SP17-212-10
ENCL NO.: 9

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
290.9							
0.0 / 290.5	**TOPSOIL:** 430mm		1	SS	8		
0.4 / 290.0	**FILL:** silty sand, trace clay, dark brown, moist, loose						
0.9 / 289.1	**SAND:** trace silt, brown, moist, very loose to compact		2	SS	4		290
1.8 / 287.9	**CLAYEY SILT TO SILTY CLAY:** trace sand, brown, moist, stiff		3	SS	11		289
			4	SS	10		
3.0	**SANDY SILT TO SILTY SAND:** trace clay, trace gravel, brown, moist, compact to dense		5	SS	13		288
			6	SS	42		287
							286
							285
	wet below 7.6m		7	SS	37		
							284
			8	SS	34		283
						W. L. 282.1 m Jun 16, 2017	
281.1			9	SS	25		
9.8	**END OF BOREHOLE**						

Notes:
1) Monitoring well installed in the borehole upon completion.
2) Water level in monitoring well at 8.8m on June 16, 2017.

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

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

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

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

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

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

AGAT Laboratories

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

CLIENT NAME: MISC AGAT CLIENT ON, ON

ATTENTION TO: Sudhakar Kurli

PROJECT: SP17-212-30

AGAT WORK ORDER: 19T494518

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Jul 25, 2019

PAGES (INCLUDING COVER): 10

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

APPENDIX B

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 19T494518

PROJECT: SP17-212-30

CLIENT NAME: MISC AGAT CLIENT ON

SAMPLING SITE:

ATTENTION TO: Sudhakar Kurli

SAMPLED BY:Sudhakar Kurl

Water Quality Assessment (mg/L)

DATE RECEIVED: 2019-07-18

DATE REPORTED: 2019-07-25

					SAMPLE DESCRIPTION:		20190717-001-MW4		20190717-002-MW2		20190717-003-MW1
					SAMPLE TYPE:		Water		Water		Water
					DATE SAMPLED:		2019-07-17		2019-07-17		2019-07-17
Parameter	Unit	G / S: A	G / S: B	RDL		RDL	362226	RDL	362272	RDL	362273
Electrical Conductivity	µS/cm			2		2	423	2	511	2	691
pH	pH Units		6.5-8.5	NA		NA	7.95	NA	7.91	NA	7.84
Saturation pH (Calculated)							7.28		7.16		7.01
Langelier Index (Calculated)							0.67		0.75		0.83
Total Hardness (as CaCO3) (Calculated)	mg/L		80-100	0.5		0.5	202	0.5	232	0.5	321
Total Dissolved Solids	mg/L		500	20		20	222[<B]	20	314[<B]	20	500[B]
Alkalinity (as CaCO3)	mg/L		30-500	5		5	176	5	214	5	219
Bicarbonate (as CaCO3)	mg/L			5		5	176	5	214	5	219
Carbonate (as CaCO3)	mg/L			5		5	<5	5	<5	5	<5
Hydroxide (as CaCO3)	mg/L			5		5	<5	5	<5	5	<5
Fluoride	mg/L	1.5		0.05		0.05	<0.05[<A]	0.05	<0.05[<A]	0.10	<0.10[<A]
Chloride	mg/L		250	0.10		0.10	5.95[<B]	0.10	8.84[<B]	0.20	7.18[<B]
Nitrate as N	mg/L	10.0		0.05		0.05	8.64[<A]	0.05	0.49[<A]	0.10	33.1[>A]
Nitrite as N	mg/L	1.0		0.05		0.05	0.27[<A]	0.05	<0.05[<A]	0.10	<0.10[<A]
Bromide	mg/L			0.05		0.05	<0.05	0.05	<0.05	0.10	<0.10
Sulphate	mg/L		500	0.10		0.10	11.5[<B]	0.10	47.0[<B]	0.20	12.5[<B]
Ortho Phosphate as P	mg/L			0.10		0.10	<0.10	0.10	<0.10	0.20	<0.20
Ammonia as N	mg/L			0.02		0.02	<0.02	0.02	<0.02	0.02	<0.02
Total Phosphorus	mg/L			0.02		0.02	1.21	0.02	0.40	0.02	0.93
Total Organic Carbon	mg/L			0.5		0.5	3.1	0.5	1.5	0.5	2.9
Colour	TCU		5	5		5	<5[<B]	5	<5[<B]	5	<5[<B]
Turbidity	NTU		5	3.0		0.5	29700[>B]	0.5	4210[>B]	0.5	7480[>B]
Calcium	mg/L			0.05		0.05	73.2	0.05	77.9	0.05	121
Magnesium	mg/L			0.05		0.05	4.56	0.05	9.16	0.05	4.69
Sodium	mg/L	20	200	0.05		0.05	3.12[<A]	0.05	3.28[<A]	0.05	3.32[<A]
Potassium	mg/L			0.05		0.05	1.55	0.05	11.3	0.05	5.86
Aluminum	mg/L		0.1	0.004		0.004	0.802[>B]	0.004	0.719[>B]	0.004	2.30[>B]
Antimony	mg/L	0.006		0.003		0.003	<0.003[<A]	0.003	<0.003[<A]	0.003	<0.003[<A]

Certified By: Vivine Basily

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 19T494518

PROJECT: SP17-212-30

CLIENT NAME: MISC AGAT CLIENT ON

SAMPLING SITE:

ATTENTION TO: Sudhakar Kurli

SAMPLED BY:Sudhakar Kurl

Water Quality Assessment (mg/L)

DATE RECEIVED: 2019-07-18

DATE REPORTED: 2019-07-25

					20190717-001-		20190717-002-		20190717-003-
			SAMPLE DESCRIPTION:		MW4		MW2		MW1
			SAMPLE TYPE:		Water		Water		Water
			DATE SAMPLED:		2019-07-17		2019-07-17		2019-07-17
Parameter	Unit	G / S: A	G / S: B	RDL	362226	RDL	362272	RDL	362273
Arsenic	mg/L	0.025		0.003	<0.003[<A]	0.003	<0.003[<A]	0.003	<0.003[<A]
Barium	mg/L	1		0.002	0.139[<A]	0.002	0.069[<A]	0.002	0.109[<A]
Beryllium	mg/L			0.001	<0.001	0.001	<0.001	0.001	<0.001
Boron	mg/L	5		0.010	0.031[<A]	0.010	0.033[<A]	0.010	0.031[<A]
Cadmium	mg/L	0.005		0.001	<0.001[<A]	0.001	<0.001[<A]	0.001	<0.001[<A]
Chromium	mg/L	0.05		0.003	<0.003[<A]	0.003	<0.003[<A]	0.003	0.004[<A]
Cobalt	mg/L			0.001	0.006	0.001	0.002	0.001	0.006
Copper	mg/L		1	0.003	<0.003[<B]	0.003	0.004[<B]	0.003	0.010[<B]
Iron	mg/L		0.3	0.010	0.654[>B]	0.010	1.31[>B]	0.010	2.65[>B]
Lead	mg/L	0.01		0.001	<0.001[<A]	0.001	0.002[<A]	0.001	0.007[<A]
Manganese	mg/L		0.05	0.002	2.40[>B]	0.002	0.230[>B]	0.002	0.834[>B]
Mercury	mg/L	0.001		0.0001	<0.0001[<A]	0.0001	<0.0001[<A]	0.0001	<0.0001[<A]
Molybdenum	mg/L			0.002	<0.002	0.002	<0.002	0.002	<0.002
Nickel	mg/L			0.003	<0.003	0.003	<0.003	0.003	<0.003
Selenium	mg/L	0.05		0.004	<0.004[<A]	0.004	<0.004[<A]	0.004	<0.004[<A]
Silver	mg/L			0.002	<0.002	0.002	<0.002	0.002	<0.002
Strontium	mg/L			0.005	1.71	0.005	0.297	0.005	0.476
Thallium	mg/L			0.006	<0.006	0.006	<0.006	0.006	<0.006
Tin	mg/L			0.002	<0.002	0.002	<0.002	0.002	<0.002
Titanium	mg/L			0.002	0.030	0.002	0.017	0.002	0.039
Tungsten	mg/L			0.010	<0.010	0.010	<0.010	0.010	<0.010
Uranium	mg/L	0.02		0.002	<0.002[<A]	0.002	<0.002[<A]	0.002	<0.002[<A]
Vanadium	mg/L			0.002	<0.002	0.002	0.003	0.002	0.005
Zinc	mg/L		5	0.005	0.008[<B]	0.005	0.008[<B]	0.005	0.020[<B]
Zirconium	mg/L			0.004	<0.004	0.004	<0.004	0.004	<0.004
% Difference/ Ion Balance (Calculated)	%			NA	4.04	NA	4.38	NA	3.43

Certified By: Vivine Basily

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 19T494518

PROJECT: SP17-212-30

CLIENT NAME: MISC AGAT CLIENT ON

SAMPLING SITE:

ATTENTION TO: Sudhakar Kurli

SAMPLED BY:Sudhakar Kurl

Water Quality Assessment (mg/L)

DATE RECEIVED: 2019-07-18 **DATE REPORTED: 2019-07-25**

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

362226 Elevated RDL indicates the degree of sample dilution prior to the analysis in order to keep analytes within the calibration range of the instrument and to reduce matrix interference.

362273 Elevated RDL indicates the degree of sample dilution prior to the analysis in order to keep analytes within the calibration range of the instrument and to reduce matrix interference.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Vivine Basily

AGAT Laboratories

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

Guideline Violation

AGAT WORK ORDER: 19T494518

PROJECT: SP17-212-30

CLIENT NAME: MISC AGAT CLIENT ON

ATTENTION TO: Sudhakar Kurli

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
362226	20190717-001-MW4	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Aluminum	mg/L	0.1	0.802
362226	20190717-001-MW4	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Iron	mg/L	0.3	0.654
362226	20190717-001-MW4	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Manganese	mg/L	0.05	2.40
362226	20190717-001-MW4	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Total Hardness (as CaCO3) (Calculate	mg/L	80-100	202
362226	20190717-001-MW4	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Turbidity	NTU	5	29700
362272	20190717-002-MW2	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Aluminum	mg/L	0.1	0.719
362272	20190717-002-MW2	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Iron	mg/L	0.3	1.31
362272	20190717-002-MW2	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Manganese	mg/L	0.05	0.230
362272	20190717-002-MW2	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Total Hardness (as CaCO3) (Calculated)	mg/L	80-100	232
362272	20190717-002-MW2	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Turbidity	NTU	5	4210
362273	20190717-003-MW1	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Aluminum	mg/L	0.1	2.30
362273	20190717-003-MW1	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Iron	mg/L	0.3	2.65
362273	20190717-003-MW1	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Manganese	mg/L	0.05	0.834
362273	20190717-003-MW1	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Total Hardness (as CaCO3) (Calculate	mg/L	80-100	321
362273	20190717-003-MW1	O.Reg. 169(mg/L)AO&OG	Water Quality Assessment (mg/L)	Turbidity	NTU	5	7480
362273	20190717-003-MW1	O.Reg.169/03(mg/L)	Water Quality Assessment (mg/L)	Nitrate as N	mg/L	10.0	33.1

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

Quality Assurance

CLIENT NAME: MISC AGAT CLIENT ON

AGAT WORK ORDER: 19T494518

PROJECT: SP17-212-30

ATTENTION TO: Sudhakar Kurli

SAMPLING SITE:

SAMPLED BY:Sudhakar Kurl

Water Analysis

RPT Date: Jul 25, 2019

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Water Quality Assessment (mg/L)															
Electrical Conductivity	360471		940	942	0.2%	< 2	108%	80%	120%						
pH	360471		8.10	8.00	1.2%	NA	100%	90%	110%						
Total Dissolved Solids	362801		164	162	1.2%	< 20	98%	80%	120%						
Alkalinity (as CaCO3)	360471		358	359	0.3%	< 5	98%	80%	120%						
Bicarbonate (as CaCO3)	360471		358	359	0.2%	< 5									
Carbonate (as CaCO3)	360471		<5	<5	NA	< 5									
Hydroxide (as CaCO3)	360471		<5	<5	NA	< 5									
Fluoride	357185		<0.25	<0.25	NA	< 0.05	99%	90%	110%	96%	90%	110%	108%	85%	115%
Chloride	357185		103	103	0.0%	< 0.10	91%	90%	110%	101%	90%	110%	111%	85%	115%
Nitrate as N	357185		0.99	1.00	NA	< 0.05	94%	90%	110%	102%	90%	110%	108%	85%	115%
Nitrite as N	357185		<0.25	<0.25	NA	< 0.05	NA	90%	110%	106%	90%	110%	108%	85%	115%
Bromide	357185		<0.25	<0.25	NA	< 0.05	93%	90%	110%	100%	90%	110%	105%	85%	115%
Sulphate	357185		128	130	1.0%	< 0.10	95%	90%	110%	101%	90%	110%	100%	85%	115%
Ortho Phosphate as P	357185		<0.50	<0.50	NA	< 0.10	97%	90%	110%	102%	90%	110%	111%	80%	120%
Ammonia as N	363013		<0.02	<0.02	NA	< 0.02	93%	90%	110%	101%	90%	110%	102%	70%	130%
Total Phosphorus	362160		0.03	<0.02	NA	< 0.02	100%	80%	120%	99%	90%	110%	101%	70%	130%
Total Organic Carbon	360517		1.3	1.2	NA	< 0.5	91%	90%	110%	92%	90%	110%	81%	80%	120%
Colour	362741		29	30	2.7%	< 5	102%	90%	110%						
Turbidity	362226	362226	29700	29800	0.6%	< 0.5	98%	90%	110%						
Calcium	362226	362226	73.2	74.3	1.5%	< 0.05	97%	90%	110%	98%	90%	110%	123%	70%	130%
Magnesium	362226	362226	4.56	4.54	0.4%	< 0.05	98%	90%	110%	99%	90%	110%	117%	70%	130%
Sodium	362226	362226	3.12	3.14	0.7%	< 0.05	96%	90%	110%	96%	90%	110%	119%	70%	130%
Potassium	362226	362226	1.55	1.57	1.1%	< 0.05	97%	90%	110%	97%	90%	110%	120%	70%	130%
Aluminum	362160		<0.004	<0.004	NA	< 0.004	94%	90%	110%	91%	90%	110%	104%	70%	130%
Antimony	362160		<0.003	<0.003	NA	< 0.003	100%	90%	110%	95%	90%	110%	118%	70%	130%
Arsenic	362160		<0.003	<0.003	NA	< 0.003	100%	90%	110%	99%	90%	110%	119%	70%	130%
Barium	362160		0.012	0.011	8.7%	< 0.002	106%	90%	110%	106%	90%	110%	121%	70%	130%
Beryllium	362160		<0.001	<0.001	NA	< 0.001	101%	90%	110%	99%	90%	110%	125%	70%	130%
Boron	362160		0.310	0.322	3.8%	< 0.010	107%	90%	110%	102%	90%	110%	100%	70%	130%
Cadmium	362160		<0.001	<0.001	NA	< 0.001	99%	90%	110%	101%	90%	110%	104%	70%	130%
Chromium	362160		<0.003	<0.003	NA	< 0.003	100%	90%	110%	103%	90%	110%	104%	70%	130%
Cobalt	362160		<0.001	<0.001	NA	< 0.001	103%	90%	110%	103%	90%	110%	130%	70%	130%
Copper	362160		<0.003	<0.003	NA	< 0.003	100%	90%	110%	105%	90%	110%	128%	70%	130%
Iron	362160		<0.010	<0.010	NA	< 0.010	110%	90%	110%	102%	90%	110%	114%	70%	130%
Lead	362160		<0.001	<0.001	NA	< 0.001	100%	90%	110%	101%	90%	110%	124%	70%	130%
Manganese	362160		0.020	0.020	0.0%	< 0.002	107%	90%	110%	106%	90%	110%	107%	70%	130%
Mercury	360517		<0.0001	<0.0001	NA	< 0.0001	101%	90%	110%	101%	80%	120%	101%	80%	120%
Molybdenum	362160		0.011	0.011	0.0%	< 0.002	104%	90%	110%	101%	90%	110%	117%	70%	130%
Nickel	362160		<0.003	<0.003	NA	< 0.003	108%	90%	110%	109%	90%	110%	106%	70%	130%

AGAT Laboratories

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

Quality Assurance

CLIENT NAME: MISC AGAT CLIENT ON

AGAT WORK ORDER: 19T494518

PROJECT: SP17-212-30

ATTENTION TO: Sudhakar Kurli

SAMPLING SITE:

SAMPLED BY:Sudhakar Kurl

Water Analysis (Continued)

RPT Date: Jul 25, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Selenium	362160		<0.004	<0.004	NA	< 0.004	103%	90%	110%	103%	90%	110%	128%	70%	130%
Silver	362160		<0.002	<0.002	NA	< 0.002	102%	90%	110%	108%	90%	110%	105%	70%	130%
Strontium	362160		16.7	16.7	0.0%	< 0.005	100%	90%	110%	101%	90%	110%	114%	70%	130%
Thallium	362160		<0.006	<0.006	NA	< 0.006	103%	90%	110%	106%	90%	110%	129%	70%	130%
Tin	362160		<0.002	<0.002	NA	< 0.002	105%	90%	110%	101%	90%	110%	125%	70%	130%
Titanium	362160		0.003	0.004	NA	< 0.002	104%	90%	110%	100%	90%	110%	124%	70%	130%
Tungsten	362160		<0.010	<0.010	NA	< 0.010	96%	90%	110%	100%	90%	110%	123%	70%	130%
Uranium	362160		<0.002	<0.002	NA	< 0.002	106%	90%	110%	91%	90%	110%	106%	70%	130%
Vanadium	362160		<0.002	<0.002	NA	< 0.002	103%	90%	110%	104%	90%	110%	103%	70%	130%
Zinc	362160		<0.005	<0.005	NA	< 0.005	93%	90%	110%	94%	90%	110%	119%	70%	130%
Zirconium	362160		<0.004	<0.004	NA	< 0.004	100%	90%	110%	99%	90%	110%	118%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Nivine Basily

AGAT Laboratories

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

Method Summary

CLIENT NAME: MISC AGAT CLIENT ON

AGAT WORK ORDER: 19T494518

PROJECT: SP17-212-30

ATTENTION TO: Sudhakar Kurli

SAMPLING SITE:

SAMPLED BY:Sudhakar Kurl

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Saturation pH (Calculated)		SM 2320 B	CALCULATION
Langelier Index (Calculated)		SM 2330B	CALCULATION
Total Hardness (as CaCO3) (Calculated)	MET-93-6105	EPA SW-846 6010C & 200.7	CALCULATION
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Bicarbonate (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Carbonate (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Hydroxide (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Fluoride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Bromide	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ortho Phosphate as P	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	SM 4500-NH3 H	LACHAT FIA
Total Phosphorus	INOR-93-6057	QuikChem 10-115-01-3-A & SM 4500-P I	LACHAT FIA
Total Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310	SHIMADZU CARBON ANALYZER
Colour	INOR-93-6046	SM 2120 B	SPECTROPHOTOMETER
Turbidity	INOR-93-6044	SM 2130 B	NEPHELOMETER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Potassium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Aluminum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Antimony	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Mercury	MET-93-6100	EPA SW 846 7470 & 245.1	CVAAS
Molybdenum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Selenium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silver	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Strontium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Thallium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Tin	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Titanium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

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

Method Summary

CLIENT NAME: MISC AGAT CLIENT ON

AGAT WORK ORDER: 19T494518

PROJECT: SP17-212-30

ATTENTION TO: Sudhakar Kurli

SAMPLING SITE:

SAMPLED BY:Sudhakar Kurl

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Tungsten	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Uranium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zirconium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
% Difference/ Ion Balance (Calculated)		SM 1030 E	CALCULATION

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 19T494518

Cooler Quantity: 1 cooler

Arrival Temperatures: 3.7 | 3.5 | 3.5
ICE 2.5 | 2.7 | 2.8

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes:

Report Information:

Company: SIRATI & PARTNERS
Contact: SUDHAKAR KURLI
Address: 12700 Keele St
King City, ON
Phone: 647. 554.7057 Fax:
Reports to be sent to:
1. Email: Sudhakar@Sirati.ca
2. Email:

Regulatory Requirements:

(Please check all applicable boxes)

☒ No Regulatory Requirement

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use ☐ Sanitary ☐ Storm
Region (Indicate One) ☐ MISA

☐ Regulation 558 ☐ CCME ☐ Prov. Water Quality Objectives (PWQO) ☐ Other
(Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☒ No

Report Guideline on *Certificate of Analysis* ☒ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: SP17-212-30
Site Location: 0 Mt. Pleasant Rd, Caledon
Sampled By: SUDHAKAR KURLI
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☒ No ☐

Company:
Contact:
Address:
Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics (☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides))	O. Reg 153: ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_2+NO_3	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	WQA Analysis					Potentially Hazardous or High Concentration (Y/N)
20190717-001-MW4	7/17	11.00	5	GW		N																X				
20190717-002-MW2	7/17	11.45	5	GW		N																X				
20190717-003-MW1	7/17	12.30	5	GW		N																X				

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
SUDHAKAR KURLI	07/18			July 18/19	9:10
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page ____ of ____

Nº: T 091326

Sirati & Partners Consultants Ltd.
ATTN: SUDHAKAR KURLI
12700 Keele St
King City ON L7B 1H5

Date Received: 19-AUG-19
Report Date: 22-AUG-19 13:14 (MT)
Version: FINAL

Client Phone: 905-833-1582

Certificate of Analysis

Lab Work Order #: L2331489

Project P.O. #: SP17-212-30
Job Reference: SP17-212-30
C of C Numbers: 17-826240
Legal Site Desc:

Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2331489-1 20190816-MW4-001 Sampled By: SK on 16-AUG-19 @ 09:00 Matrix: WATER							
Anions and Nutrients							
Nitrate (as N)	4.29		0.020	mg/L		21-AUG-19	R4764382
L2331489-2 20190816-MW1-002 Sampled By: SK on 16-AUG-19 @ 09:30 Matrix: WATER							
Anions and Nutrients							
Nitrate (as N)	34.0		0.020	mg/L		21-AUG-19	R4764382
L2331489-3 20190816-MW2-003 Sampled By: SK on 16-AUG-19 @ 10:15 Matrix: WATER							
Anions and Nutrients							
Nitrate (as N)	0.642		0.020	mg/L		21-AUG-19	R4764382

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

17-826240

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2331489 Report Date: 22-AUG-19

Client: Sirati & Partners Consultants Ltd.
12700 Keele St
King City ON L7B 1H5
Contact: SUDHAKAR KURLI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R4764382								
WG3138919-4 DUP		**WG3138919-3**						
Nitrate (as N)		2.24	2.24		mg/L	0.0	20	21-AUG-19
WG3138919-2 LCS								
Nitrate (as N)			102.0		%		90-110	21-AUG-19
WG3138919-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	21-AUG-19
WG3138919-5 MS		**WG3138919-3**						
Nitrate (as N)			102.1		%		75-125	21-AUG-19

Quality Control Report

Workorder: L2331489 Report Date: 22-AUG-19

Client: Sirati & Partners Consultants Ltd.
12700 Keele St
King City ON L7B 1H5
Contact: SUDHAKAR KURLI

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2331489-COFC

COC Number: 17 - 826240

Page of

Report To	Contact and company name below will appear on the final report
Company:	SIRATI & PARTNERS
Contact:	SUDHAKAR KURU
Phone:	647. 554. 9057
	Company address below will appear on the final report
Street:	12700 Keele St
City/Province:	KING CITY, ON
Postal Code:	
Invoice To	Same as Report To YES NO
	Copy of Invoice with Report YES NO
Company:	SIRATI & PARTNERS
Contact:	

Report Format / Distribution	
Select Report Format:	PDF EXCEL EDD (DIGITAL)
Quality Control (QC) Report with Report	YES NO
Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	EMAIL MAIL FAX
Email 1 or Fax	Sudhakar@sirati.ca
Email 2	bwing@sirati.ca
Email 3	ggriffe@sirati.ca

Invoice Distribution	
Select Invoice Distribution:	EMAIL MAIL FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	25609
Job #:	SP17-212-30
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L2331489 RD

ALS Contact: RICK

Sampler: SUDHAKAR

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] 3 day [P3-25%] 2 day [P2-50%]

EMERGENCY: 1 Business day [E - 100%] Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	NITRATE AS NO3	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	20190816-MW4-001	16-Aug-19	9AM	GW	1	X		
	20190816-MW1-002	"	9.30AM	GW	1	X		
	20190816-MW2-003	"	10.15AM	GW	1	X		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? YES NO

Are samples for human consumption/ use? YES NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen SIF Observations Yes No

Ice Packs Ice Cubes Custody seal intact Yes No

Cooling Initiated

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				7.6			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: SUDHAKAR KURU	Date:	Time:	Received by:	Date:	Time:	Received by:	Date: Aug 19/19	Time: 19:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Sirati & Partners Consultants Ltd.
ATTN: SUDHAKAR KURLI
12700 Keele St
King City ON L7B 1H5

Date Received: 19-AUG-19
Report Date: 22-AUG-19 13:14 (MT)
Version: FINAL

Client Phone: 905-833-1582

Certificate of Analysis

Lab Work Order #: L2331489

Project P.O. #: SP17-212-30
Job Reference: SP17-212-30
C of C Numbers: 17-826240
Legal Site Desc:

Rick Hawthorne
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2331489-1 20190816-MW4-001 Sampled By: SK on 16-AUG-19 @ 09:00 Matrix: WATER							
Anions and Nutrients							
Nitrate (as N)	4.29		0.020	mg/L		21-AUG-19	R4764382
L2331489-2 20190816-MW1-002 Sampled By: SK on 16-AUG-19 @ 09:30 Matrix: WATER							
Anions and Nutrients							
Nitrate (as N)	34.0		0.020	mg/L		21-AUG-19	R4764382
L2331489-3 20190816-MW2-003 Sampled By: SK on 16-AUG-19 @ 10:15 Matrix: WATER							
Anions and Nutrients							
Nitrate (as N)	0.642		0.020	mg/L		21-AUG-19	R4764382

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

17-826240

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2331489 Report Date: 22-AUG-19

Client: Sirati & Partners Consultants Ltd.
12700 Keele St
King City ON L7B 1H5
Contact: SUDHAKAR KURLI

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R4764382								
WG3138919-4 DUP		**WG3138919-3**						
Nitrate (as N)		2.24	2.24		mg/L	0.0	20	21-AUG-19
WG3138919-2 LCS								
Nitrate (as N)			102.0		%		90-110	21-AUG-19
WG3138919-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	21-AUG-19
WG3138919-5 MS		**WG3138919-3**						
Nitrate (as N)			102.1		%		75-125	21-AUG-19

Quality Control Report

Workorder: L2331489 Report Date: 22-AUG-19

Client: Sirati & Partners Consultants Ltd.
12700 Keele St
King City ON L7B 1H5
Contact: SUDHAKAR KURLI

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2331489-COFC

COC Number: 17 - 826240

Page of

Report To	Contact and company name below will appear on the final report
Company:	SIRATI & PARTNERS
Contact:	SUDHAKAR KURU
Phone:	647. 554. 9057
	Company address below will appear on the final report
Street:	12700 Keele St
City/Province:	KING CITY, ON
Postal Code:	
Invoice To	Same as Report To YES NO
	Copy of Invoice with Report YES NO
Company:	SIRATI & PARTNERS
Contact:	

Report Format / Distribution	
Select Report Format:	PDF EXCEL EDD (DIGITAL)
Quality Control (QC) Report with Report	YES NO
Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	EMAIL MAIL FAX
Email 1 or Fax	Sudhakar@sirati.ca
Email 2	bwing@sirati.ca
Email 3	ggriffe@sirati.ca

Invoice Distribution	
Select Invoice Distribution:	EMAIL MAIL FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	25609
Job #:	SP17-212-30
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L2331489 RD

ALS Contact: RICK

Sampler: SUDHAKAR

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] 3 day [P3-25%] 2 day [P2-50%]

EMERGENCY: 1 Business day [E - 100%] Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	NITRATE AS NO3	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	20190816-MW4-001	16-Aug-19	9AM	GW	1	X		
	20190816-MW1-002	"	9.30AM	GW	1	X		
	20190816-MW2-003	"	10.15AM	GW	1	X		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? YES NO

Are samples for human consumption/ use? YES NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen SIF Observations Yes No

Ice Packs Ice Cubes Custody seal intact Yes No

Cooling Initiated

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				7.6			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: SUDHAKAR KURU	Date:	Time:	Received by:	Date:	Time:	Received by:	Date: Aug 19/19	Time: 19:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

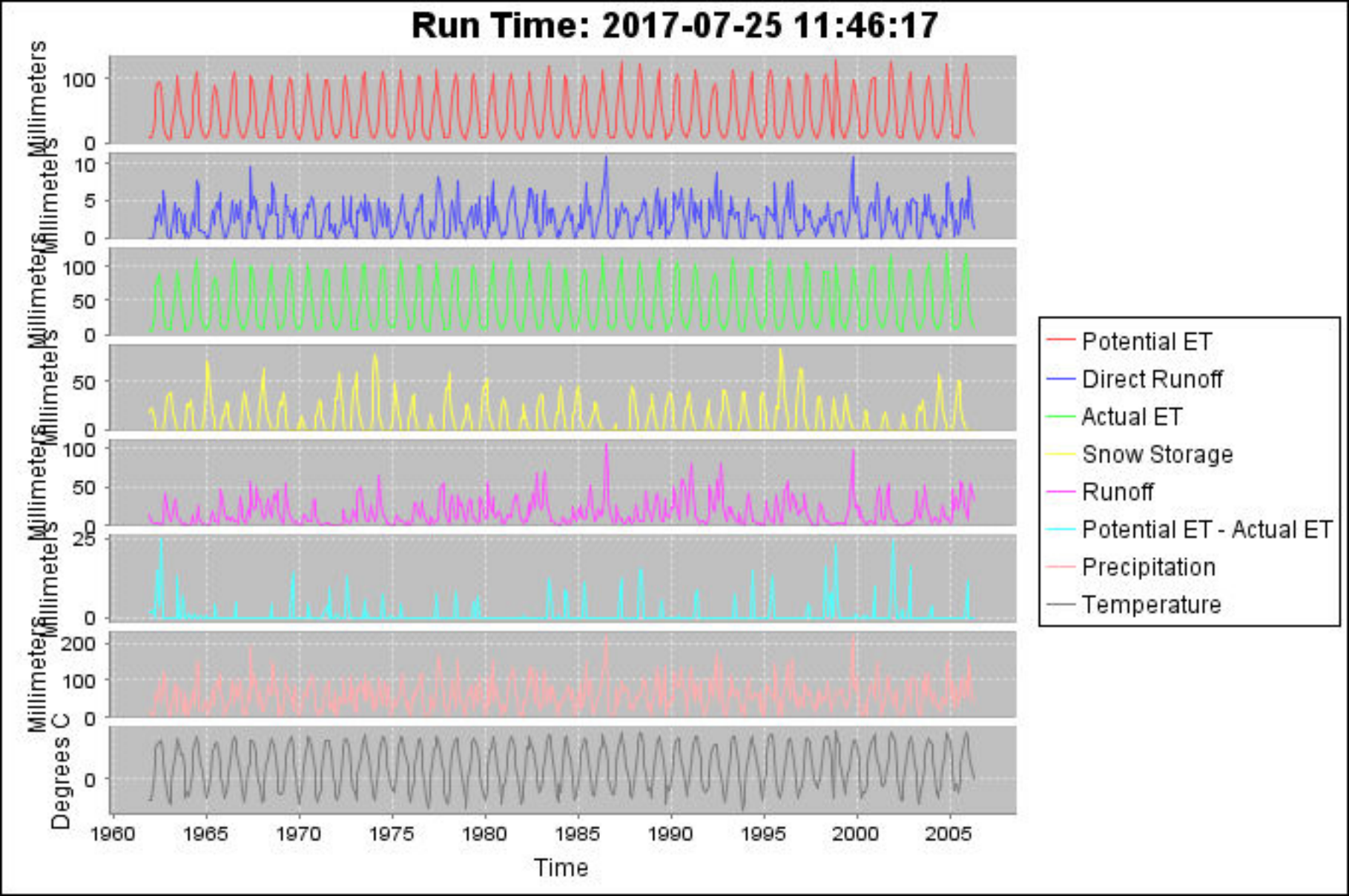
JUNE 2018 FRONT

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

APPENDIX C

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions


Run Time: 2017-07-25 11:46:17
Millimeters
100
0
Millimeters
10
5
0
Millimeters
100
50
0
Millimeters
50
0
Millimeters
100
50
0
Millimeters
25
0
Millimeters
200
100
0
Degrees C
0
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Time
Potential ET
Direct Runoff
Actual ET
Snow Storage
Runoff
Potential ET - Actual ET
Precipitation
Temperature

Date	PET	P	p-PET	soil Moisture	AET	PET-AET	Snow Storage	surplus	Rototal
Jan-62	6.7	17.5	-6.5	145.1	5.1	1.6	17.3	0	12.7
Feb-62	7.7	4.6	-7.5	139.6	5.6	2.1	21.8	0	6.4
Mar-62	16.2	3.8	-8.8	133.5	13.5	2.7	18.2	0	3.3
Apr-62	35.9	31.5	3.1	136.6	35.9	0	9.1	0	3.2
May-62	74.8	58.4	-10.2	129.6	71.5	3.2	0	0	3.7
Jun-62	90.4	50	-42.9	101.8	75.3	15.1	0	0	2.9
Jul-62	93.4	90.9	-7.1	98.2	90	3.5	0	0	4.7
Aug-62	84	37.3	-48.5	74.4	59.3	24.7	0	0	2
Sep-62	45.6	86.4	36.4	110.8	45.6	0	0	0	4.4
Oct-62	29.5	125.7	89.9	200	29.5	0	0	0.8	6.7
Nov-62	13.2	105.9	75.6	200	13.2	0	12.9	75.6	42.2
Dec-62	7.7	38.9	8.3	200	7.7	0	35.3	8.3	23.7
Jan-63	6.3	1	-6.3	193.7	6.3	0	36.3	0	11.6
Feb-63	6.9	1.5	-6.9	187	6.6	0.2	37.8	0	5.8
Mar-63	17.9	38.1	19.5	200	17.9	0	37.5	6.5	7.3
Apr-63	35	46.2	27.6	200	35	0	18.7	27.6	19.2
May-63	57.3	94.2	41.6	200	57.3	0	9.4	41.6	33.9
Jun-63	92.6	14.5	-69.5	130.5	92.6	0	0	0	15.3
Jul-63	105.1	70.9	-37.7	105.9	92	13.1	0	0	10.9
Aug-63	75.6	80	0.4	106.3	75.6	0	0	0	7.7
Sep-63	44.2	65.8	18.3	124.6	44.2	0	0	0	5.1
Oct-63	35.1	18.3	-17.7	113.6	28.4	6.7	0	0	1.8
Nov-63	16.8	64.3	44.3	157.9	16.8	0	0	0	3.7
Dec-63	6.6	2.8	-3.8	154.9	5.8	0.8	0	0	0.2
Jan-64	8.5	45.7	9.3	164.3	8.5	0	27.2	0	0.8
Feb-64	8.7	0	-6.5	158.9	7.5	1.2	25	0	0.1
Mar-64	17.3	37.1	13.8	172.7	17.3	0	29.9	0	1.1
Apr-64	33.1	69.3	47.7	200	33.1	0	15	20.4	13.7
May-64	69.9	59.7	-5.7	194.3	69.9	0	7.5	0	8.1
Jun-64	89.3	33.8	-49.7	146.1	87.9	1.4	0	0	4.2
Jul-64	111.1	152.7	33.9	180	111.1	0	0	0	8.9
Aug-64	72.4	136.1	56.9	200	72.4	0	0	36.9	25.9
Sep-64	48.9	21.6	-28.3	171.7	48.9	0	0	0	10.6
Oct-64	25.9	23.1	-3.9	168.3	25.3	0.6	0	0	5.9
Nov-64	15.4	17	0.8	169.1	15.4	0	0	0	3.2
Dec-64	8.6	42.4	13.2	182.3	8.6	0	19.7	0	2.1
Jan-65	7.1	27.9	-3.1	179.5	6.9	0.3	43.4	0	0.7
Feb-65	8.9	42.2	5.9	185.4	8.9	0	70.4	0	0.7
Mar-65	14.6	3.3	-0.9	184.6	14.5	0.1	60	0	0.2
Apr-65	27.8	37.8	31.4	200	27.8	0	37	16	9.7
May-65	69	75.2	20.9	200	69	0	18.5	20.9	18.3
Jun-65	84.4	35.3	-41.6	158.4	84.4	0	9.2	0	9
Jul-65	87.3	58.7	-22.3	140.7	82.6	4.6	0	0	6.6
Aug-65	78.9	96.5	12.8	153.5	78.9	0	0	0	6.6
Sep-65	52.3	80.8	24.5	178	52.3	0	0	0	4.9
Oct-65	25.9	119.9	88	200	25.9	0	0	66	39.4
Nov-65	13.8	69.1	52.3	200	13.8	0	0	52.3	45.8
Dec-65	10	51.1	25	200	10	0	14.6	25	35.5

Jan-66	7	2.8	-6.3	193.7	7	0	16.7	0	17
Feb-66	9.5	20.6	0.1	193.8	9.5	0	27.4	0	8.8
Mar-66	19.2	36.1	17.5	200	19.2	0	25.5	11.3	11.1
Apr-66	30.5	29	9.2	200	30.5	0	13.4	9.2	11
May-66	52.5	48.8	0.5	200	52.5	0	6.7	0.5	7.5
Jun-66	93.2	101.3	9.7	200	93.2	0	0	9.7	12.4
Jul-66	109.1	40.4	-70.7	129.3	109.1	0	0	0	5.7
Aug-66	85	74.7	-14.1	120.2	80	5	0	0	5.6
Sep-66	45.6	87.9	37.9	158.1	45.6	0	0	0	5.3
Oct-66	26.9	52.3	22.8	180.9	26.9	0	0	0	3.1
Nov-66	15	103.4	83.5	200	15	0	0	64.4	37.4
Dec-66	8.2	41.4	10.7	200	8.2	0	21.7	10.7	22.3
Jan-67	9.2	9.9	0	200	9.2	0	22.1	0	11
Feb-67	7.3	16	-7.3	192.7	7.3	0	38.1	0	5.4
Mar-67	16.2	2.5	-5.7	187.2	16	0.2	30.1	0	2.8
Apr-67	33.9	69.9	47.5	200	33.9	0	15.1	34.7	22.2
May-67	49.1	42.7	-1	199	49.1	0	7.5	0	11.5
Jun-67	102.3	191.8	87.4	200	102.3	0	0	86.5	57.5
Jul-67	97.6	78.7	-22.8	177.2	97.6	0	0	0	27.9
Aug-67	76.5	111.8	29.7	200	76.5	0	0	6.9	21
Sep-67	45.9	75.9	26.2	200	45.9	0	0	26.2	24.6
Oct-67	27.5	99.8	67.3	200	27.5	0	0	67.3	49
Nov-67	12.3	34.3	20.8	200	12.3	0	0	20.8	33.6
Dec-67	9.1	72.1	32.9	200	9.1	0	28.4	32.9	34.4
Jan-68	6.5	16.5	-6.5	193.5	6.5	0	44.9	0	16.3
Feb-68	7.6	17	-7.6	186.1	7.4	0.2	61.9	0	8.2
Mar-68	19.6	27.2	23.4	200	19.6	0	45.2	9.5	9.8
Apr-68	38.6	38.9	20.9	200	38.6	0	22.6	20.9	16.8
May-68	55.2	92.7	44.2	200	55.2	0	11.3	44.2	34.1
Jun-68	89.8	62	-25.3	174.7	89.8	0	5.6	0	17.9
Jul-68	103.8	68.6	-33	145.9	99.6	4.2	0	0	10.8
Aug-68	84.5	150.4	58.4	200	84.5	0	0	4.3	13.4
Sep-68	56.7	125.5	62.5	200	56.7	0	0	62.5	40.5
Oct-68	31.6	64.8	30	200	31.6	0	0	30	35.3
Nov-68	13.7	76.7	53.1	200	13.7	0	6.6	53.1	45.8
Dec-68	7.6	8.6	-3.8	196.2	7.6	0	11.3	0	21.4
Jan-69	7.9	26.4	0.5	196.8	7.9	0	29	0	10.9
Feb-69	9.2	0	-5.9	191	9.1	0.1	25.8	0	5.3
Mar-69	15.7	40.4	11.6	200	15.7	0	38	2.6	4.8
Apr-69	36.3	117.3	94.1	200	36.3	0	19	94.1	54.9
May-69	61	84.1	28.4	200	61	0	9.5	28.4	42.9
Jun-69	83.4	85.6	7.4	200	83.4	0	0	7.4	27.4
Jul-69	100.6	56.1	-47.3	152.7	100.6	0	0	0	14.3
Aug-69	93.3	56.4	-39.7	122.3	83.9	9.4	0	0	8.6
Sep-69	52	15.7	-37.1	99.7	37.6	14.4	0	0	3.7
Oct-69	27.2	65.3	34.8	134.5	27.2	0	0	0	4.7
Nov-69	14.6	85.9	67.3	200	14.6	0	0	1.8	5.6
Dec-69	7.3	10.9	3.5	200	7.3	0	0	3.5	2.7
Jan-70	5.9	8.1	-5.9	194.1	5.9	0	8.1	0	1.3

Feb-70	8.3	1	0.8	194.9	8.3	0	0	0	0.6
Mar-70	14.9	26.4	-2.4	192.6	14.9	0.1	13.4	0	0.8
Apr-70	34.8	60.5	29.4	200	34.8	0	6.7	21.9	14.2
May-70	66.5	70.9	7.6	200	66.5	0	0	7.6	12.9
Jun-70	90.9	53.6	-40	160	90.9	0	0	0	7.4
Jul-70	108.4	90.7	-22.2	142.2	104	4.4	0	0	6.9
Aug-70	86.6	86.4	-4.5	139	85.3	1.3	0	0	5.5
Sep-70	53	110.7	52.2	191.2	53	0	0	0	6.1
Oct-70	30.2	101.1	65.8	200	30.2	0	0	57	33.9
Nov-70	15.1	47	29.7	200	15.1	0	0	29.7	31.5
Dec-70	7.5	20.8	-0.7	199.3	7.5	0	13.7	0	14.9
Jan-71	6.4	5.1	-6.4	193	6.3	0	18.8	0	7.3
Feb-71	9.4	20.6	0	192.9	9.4	0	29.8	0	3.9
Mar-71	14.7	4.8	-7.2	186	14.4	0.3	27.1	0	1.9
Apr-71	30.3	20.3	1.8	187.8	30.3	0	14.3	0	1.9
May-71	61	31	-24.4	164.9	59.5	1.5	7.1	0	2
Jun-71	98.6	81.5	-14	153.3	96.1	2.5	0	0	4.3
Jul-71	98.2	87.1	-15.4	141.5	94.6	3.6	0	0	4.5
Aug-71	81.9	97.5	10.7	152.2	81.9	0	0	0	4.9
Sep-71	58.5	21.8	-37.8	123.5	49.5	9	0	0	1.1
Oct-71	36.4	37.8	-0.5	123.2	36.2	0.2	0	0	1.9
Nov-71	14	18.5	3.7	126.9	14	0	0	0	0.8
Dec-71	9.6	70.9	36.1	163	9.6	0	23.2	0	1.9
Jan-72	7.7	15	-1.9	161.4	7.4	0.4	32.3	0	0.1
Feb-72	8	0	-7.1	155.7	6.6	1.4	31.4	0	0
Mar-72	13.9	53.6	10.7	166.3	13.9	0	59.8	0	0.8
Apr-72	27.5	39.6	32.4	198.7	27.5	0	37.8	0	1.7
May-72	68.6	56.1	3.6	200	68.6	0	18.9	2.4	4
Jun-72	81.8	109.5	31.6	200	81.8	0	9.5	31.6	21.9
Jul-72	105.1	36.8	-60.7	139.3	105.1	0	0	0	10
Aug-72	82.9	42.7	-42.4	109.8	70.1	12.9	0	0	6.2
Sep-72	53.6	50.5	-5.6	106.7	51.1	2.5	0	0	4.6
Oct-72	24	112.5	82.9	189.6	24	0	0	0	6.7
Nov-72	12.6	41.4	20.6	200	12.6	0	6.6	10.2	7.1
Dec-72	8.7	76.5	33.2	200	8.7	0	39.6	33.2	21
Jan-73	8.6	19.8	5.4	200	8.6	0	45.1	5.4	12.7
Feb-73	7.9	14.7	-6.2	193.8	7.9	0	58.1	0	6.2
Mar-73	23.3	82.8	78.6	200	23.3	0	35.2	72.4	43.1
Apr-73	36.1	70.4	48.4	200	36.1	0	17.6	48.4	47.4
May-73	58	98	43.9	200	58	0	8.8	43.9	48.8
Jun-73	100.4	78	-17.5	182.5	100.4	0	0	0	25.8
Jul-73	110.4	46	-66.7	121.6	104.6	5.9	0	0	13.3
Aug-73	99.9	115.8	10.1	131.7	99.9	0	0	0	11.3
Sep-73	52.3	50	-4.8	128.5	50.7	1.6	0	0	5.2
Oct-73	31.7	95.3	58.8	187.3	31.7	0	0	0	6.1
Nov-73	14.5	77.7	59.6	200	14.5	0	0	46.9	27.7
Dec-73	8.3	23.1	2.5	200	8.3	0	11.9	2.5	13.7
Jan-74	8.2	69.6	16.2	200	8.2	0	56.3	16.2	15.6
Feb-74	7.7	21.1	-7.2	192.8	7.7	0	76.9	0	7.4

Mar-74	17.1	36.3	26.9	200	17.1	0	68.2	19.7	14.5
Apr-74	37.2	104.1	95.8	200	37.2	0	34.1	95.8	59.9
May-74	55.5	106.2	62.4	200	55.5	0	17.1	62.4	63.8
Jun-74	90.9	64.8	-20.8	179.2	90.9	0	8.5	0	32.5
Jul-74	109.1	33.5	-68.7	117.6	101.9	7.2	0	0	16.3
Aug-74	91	96.5	0.7	118.3	91	0	0	0	12.1
Sep-74	48.3	51.1	0.3	118.5	48.3	0	0	0	6.2
Oct-74	26.4	31.8	3.9	122.4	26.4	0	0	0	3.4
Nov-74	14.7	85.1	66.4	188.8	14.7	0	0	0	4.9
Dec-74	9.8	3.3	-6.6	182.6	9.4	0.4	0	0	0.6
Jan-75	9.1	19.1	0.1	182.7	9.1	0	9.5	0	0.6
Feb-75	9.8	47.5	10.6	193.3	9.8	0	35.8	0	0.8
Mar-75	15.3	41.9	13.2	200	15.3	0	48.4	6.5	4.2
Apr-75	26.8	35.1	23	200	26.8	0	32.3	23	14.6
May-75	80.1	59.4	-7.5	192.5	80.1	0	16.2	0	9.5
Jun-75	99.8	66.5	-28.5	165	98.7	1.1	8.1	0	6.6
Jul-75	112.5	85.1	-23.6	145.6	108.4	4.1	0	0	5.9
Aug-75	88.2	117.9	23.8	169.3	88.2	0	0	0	6.7
Sep-75	45.6	65	16.1	185.4	45.6	0	0	0	3.7
Oct-75	30.2	28.4	-3.2	182.5	30	0.2	0	0	1.6
Nov-75	18	44.7	24.4	200	18	0	0	6.9	5.8
Dec-75	7.6	18.5	-1.2	198.8	7.6	0	11.8	0	2
Jan-76	6.3	3.6	-6.3	192.5	6.3	0	15.4	0	0.9
Feb-76	10.8	44.5	16	200	10.8	0	32.1	8.6	5.7
Mar-76	19	68.1	42.6	200	19	0	36.4	42.6	25.9
Apr-76	37.9	51.8	29.5	200	37.9	0	18.2	29.5	29.1
May-76	58.4	77.7	24.5	200	58.4	0	9.1	24.5	29.4
Jun-76	102.3	76.5	-20.5	179.5	102.3	0	0	0	16.6
Jul-76	101.9	112.8	5.3	184.7	101.9	0	0	0	12
Sep-76	49.5	116.8	61.5	200	49.5	0	0	46.2	32.1
Oct-76	23.3	42.7	17.3	200	23.3	0	0	17.3	23.9
Nov-76	11.5	17.8	5.8	200	11.5	0	0	5.8	14.3
Dec-76	6.6	1.3	-5.3	194.7	6.6	0	0	0	6.9
Jan-77	5.5	0	-5.5	189.4	5.4	0.1	0	0	3.4
Feb-77	8.8	16.8	-4.8	184.8	8.5	0.3	12.7	0	1.9
Mar-77	21	59.3	33.4	200	21	0	15.2	18.2	12.3
Apr-77	38.4	37.9	5.2	200	38.4	0	7.6	5.2	9.5
May-77	73.4	23.1	-43.8	156.2	73.4	0	0	0	5
Jun-77	85.5	73	-16.1	143.6	81.9	3.5	0	0	5.5
Jul-77	113.2	90.3	-27.4	123.9	105.5	7.7	0	0	5.5
Aug-77	82.4	164	73.4	197.3	82.4	0	0	0	8.7
Sep-77	51.7	142.9	84.1	200	51.7	0	0	81.3	48.1
Oct-77	26.5	86.8	55.9	200	26.5	0	0	55.9	52.8
Nov-77	14.9	70.3	52.1	200	14.9	0	0	52.1	53.6
Dec-77	7.8	26.6	2.4	200	7.8	0	16	2.4	26.7
Jan-78	6.6	25.9	-6.6	193.4	6.6	0	41.9	0	13.2
Feb-78	6.8	0	-6.8	186.8	6.5	0.2	41.9	0	6.6
Mar-78	14.5	43.2	11.3	198.2	14.5	0	58.6	0	4
Apr-78	29.6	48.8	42.9	200	29.6	0	32.6	41.1	24.5

May-78	67.3	100.2	44.2	200	67.3	0	16.3	44.2	38.2
Jun-78	91.5	64.8	-21.8	178.2	91.5	0	8.2	0	19.8
Jul-78	107.1	23.8	-76.3	110.2	98.8	8.3	0	0	9.5
Aug-78	89.3	153.8	56.8	167	89.3	0	0	0	11.8
Sep-78	49.8	152.2	94.8	200	49.8	0	0	61.8	40.6
Oct-78	27	45.2	15.9	200	27	0	0	15.9	26.7
Nov-78	14	46.6	30.6	200	14	0	0	30.6	29.5
Dec-78	8.6	20.4	1.9	200	8.6	0	9.5	1.9	15.1
Jan-79	6.9	4	-6.4	193.6	6.9	0	13	0	7.4
Feb-79	6.3	12.2	-6.3	187.4	6.1	0.2	25.2	0	3.7
Mar-79	20.2	71.4	46.4	200	20.2	0	27.3	33.9	21.4
Apr-79	31.5	64.6	43.5	200	31.5	0	13.6	43.5	34.4
May-79	61.7	84.2	25.1	200	61.7	0	6.8	25.1	32.3
Jun-79	92.6	78.4	-11.3	188.7	92.6	0	0	0	18
Jul-79	106.4	25	-82.7	110.7	101.7	4.7	0	0	8.3
Aug-79	80.9	89.2	3.8	114.5	80.9	0	0	0	8
Sep-79	51.3	37.4	-15.8	105.5	44.6	6.8	0	0	3.6
Oct-79	26.9	111.2	78.8	184.3	26.9	0	0	0	6.4
Nov-79	14.6	99.6	80.4	200	14.6	0	0	64.6	37.4
Dec-79	9.5	60.2	28.2	200	9.5	0	21	28.2	32
Jan-80	8	37.8	5.8	200	8	0	44.6	5.8	18.5
Feb-80	7.8	1	-7.2	192.8	7.8	0	45.1	0	9.1
Mar-80	16.1	43.4	19	200	16.1	0	52.3	11.8	11.5
Apr-80	34.3	109.3	95.7	200	34.3	0	26.2	95.7	58.5
May-80	69.9	34.2	-24.3	175.7	69.9	0	13.1	0	28.2
Jun-80	79.3	102	24.1	199.8	79.3	0	6.5	0	18.4
Jul-80	107.7	156.2	47.2	200	107.7	0	0	47	37.9
Aug-80	94.5	46	-50.8	149.2	94.5	0	0	0	17.4
Sep-80	49.5	86	32.2	181.5	49.5	0	0	0	11.8
Oct-80	23.6	66	39.1	200	23.6	0	0	20.6	17.4
Nov-80	12.9	33.8	19.6	200	12.9	0	0	19.6	18.1
Dec-80	6.8	29.2	-1.9	198.1	6.8	0	24.1	0	8.6
Jan-81	6	0	-6	192.2	5.9	0.1	24.1	0	4.2
Feb-81	11.4	35.7	15.5	200	11.4	0	32	7.7	6.8
Mar-81	18.2	16	2.9	200	18.2	0	26.4	2.9	4.9
Apr-81	36.8	43.6	17.8	200	36.8	0	13.2	17.8	13.3
May-81	59.8	60	3.8	200	59.8	0	6.6	3.8	10.5
Jun-81	94.4	101.8	8.9	200	94.4	0	0	8.9	13.3
Jul-81	108.4	115.4	1.2	200	108.4	0	0	1.2	10.5
Aug-81	84.5	136	44.7	200	84.5	0	0	44.7	31.5
Sep-81	49.5	88.8	34.9	200	49.5	0	0	34.9	34.2
Oct-81	24.2	70.6	42.9	200	24.2	0	0	42.9	39.9
Nov-81	14.3	53.8	37	200	14.3	0	0	37	39.1
Dec-81	8.7	4.6	-4.2	195.8	8.7	0	0	0	18.4
Jan-82	5.9	12.2	-5.9	190	5.8	0.1	12.2	0	9.2
Feb-82	8.2	0	-7.7	182.8	7.8	0.4	11.6	0	4.6
Mar-82	16.2	43	11.3	194.1	16.2	0	26.2	0	3.3
Apr-82	30.9	39	19	200	30.9	0	13.3	13.1	9.6
May-82	77.1	60.6	-12.9	187.1	77.1	0	6.7	0	6.9

Jun-82	80.8	132.6	51.8	200	80.8	0	0	38.9	28
Jul-82	109.1	83.8	-29.5	170.5	109.1	0	0	0	14.9
Aug-82	75.6	132.6	50.4	200	75.6	0	0	20.9	22.4
Sep-82	50.1	110.8	55.2	200	50.1	0	0	55.2	41
Oct-82	29.1	41.2	10	200	29.1	0	0	10	24.8
Nov-82	15	123.4	102.5	200	15	0	0	102.5	68.5
Dec-82	10.7	90	57	200	10.7	0	19.3	57	62.9
Jan-83	8.5	24.6	3.8	200	8.5	0	31.3	3.8	32.1
Feb-83	10.7	24.2	8.2	200	10.7	0	36.1	8.2	20.5
Mar-83	19.1	50	30.7	200	19.1	0	34.6	30.7	27
Apr-83	32.3	96.2	76.4	200	32.3	0	17.3	76.4	55.7
May-83	54.5	126.4	74.2	200	54.5	0	8.6	74.2	68.9
Jun-83	94.4	35	-52.5	147.5	94.4	0	0	0	33
Jul-83	118.2	75.4	-46.6	113.1	106	12.2	0	0	19.4
Aug-83	95.6	81.2	-18.5	102.7	87.6	8	0	0	11.9
Sep-83	57	43.4	-15.8	94.5	49.4	7.7	0	0	6.1
Oct-83	28.2	82	49.7	144.2	28.2	0	0	0	6.1
Nov-83	14.3	50.4	33.8	178	14.3	0	0	0	3.3
Dec-83	7.2	24.6	-0.9	177.2	7.1	0.1	18.1	0	0.7
Jan-84	6.5	0	-6.5	171.4	5.8	0.7	18.1	0	0.2
Feb-84	12	40.5	19.4	190.8	12	0	26	0	1.2
Mar-84	13.8	34.4	2.4	193.2	13.8	0	43.8	0	0.5
Apr-84	36.8	44.2	27.1	200	36.8	0	21.9	20.3	12.4
Jun-84	96.8	54.6	-33.9	166.1	96.8	0	10.9	0	7.8
Jul-84	104.4	49.4	-52	122.9	95.6	8.8	5.5	0	5
Aug-84	96.2	73.8	-20.7	110.2	88.3	8	0	0	5
Sep-84	46.8	86.7	35.6	145.7	46.8	0	0	0	5
Oct-84	30.6	49.6	16.5	162.3	30.6	0	0	0	2.8
Nov-84	14	76.2	58.9	200	14	0	0	21.2	14.1
Dec-84	10.2	63.2	34.3	200	10.2	0	16.8	34.3	24.5
Jan-85	6.8	0.8	-6.6	193.4	6.8	0	17.3	0	11.3
Feb-85	8.9	32.4	1.3	194.8	8.9	0	39.2	0	5.9
Mar-85	18.1	63.1	37.9	200	18.1	0	44.4	32.6	21
Apr-85	39.6	25	6.3	200	39.6	0	22.2	6.3	14
May-85	67.7	91.6	30.4	200	67.7	0	11.1	30.4	26.1
Jun-85	82.9	26.6	-52	148	82.9	0	5.6	0	12.1
Jul-85	105.1	59.6	-42.9	116.2	93.9	11.2	0	0	8.4
Aug-85	85	148.7	56.2	172.5	85	0	0	0	10.1
Sep-85	57.4	118.9	55.6	200	57.4	0	0	28	21.3
Oct-85	28.6	62.4	30.7	200	28.6	0	0	30.7	26.1
Nov-85	13.9	100.6	74.6	200	13.9	0	7.7	74.6	53.2
Dec-85	7.6	12.4	-2.4	197.6	7.6	0	14.8	0	24.6
Jan-86	7.9	10.2	-3.6	194.1	7.8	0	20.6	0	12.3
Feb-86	8.5	10.1	-5.4	188.9	8.3	0.2	27.5	0	6.2
Mar-86	19.5	40.4	21.2	200	19.5	0	25.8	10.1	9.5
Apr-86	39.4	57.5	28.2	200	39.4	0	12.9	28.2	21
May-86	74.3	72.1	0.6	200	74.3	0	6.5	0.6	13
Jun-86	86	106.9	22	200	86	0	0	22	21
Jul-86	114.6	122	1.3	200	114.6	0	0	1.3	14.6

Aug-86	81.4	145.6	56.9	200	81.4	0	0	56.9	40
Sep-86	51.3	218.9	156.6	200	51.3	0	0	156.6	105.6
Oct-86	27.7	65.6	34.6	200	27.7	0	0	34.6	67.9
Nov-86	12.8	18.4	4.9	200	12.8	0	0	4.9	35.5
Dec-86	9.3	9.2	-0.4	199.6	9.3	0	0	0	17.6
Jan-87	8.2	2.4	-5.8	193.8	8.2	0	0	0	8.7
Feb-87	9.1	8	-1.1	192.7	9	0	0	0	4.4
Mar-87	20.2	41.7	13.2	200	20.2	0	6.7	5.9	6.7
Apr-87	41.4	80	41.3	200	41.4	0	0	41.3	27.2
May-87	73.9	33.6	-41.9	158.1	73.9	0	0	0	13.3
Jun-87	101	62	-42.1	124.7	92.2	8.8	0	0	8.9
Jul-87	124.2	95.1	-33.9	103.6	111.5	12.8	0	0	7.7
Aug-87	88.2	91.6	-1.2	103	87.7	0.6	0	0	6
Sep-87	54	68.5	11.1	114.1	54	0	0	0	4.2
Oct-87	24.8	79	50.3	164.4	24.8	0	0	0	4.3
Nov-87	14.3	70.2	52.8	200	14.3	0	0	17.2	11.9
Dec-87	9.8	23.3	12.8	200	9.8	0	0	12.8	11.5
Jan-88	7.9	39.2	3.2	200	7.9	0	27.7	3.2	7.4
Feb-88	8.4	21	-3.5	196.5	8.4	0	43.7	0	3.6
Mar-88	17.4	25.4	11.6	200	17.4	0	39.3	8.1	6.5
Apr-88	34.3	58.9	41.3	200	34.3	0	19.7	41.3	26.5
May-88	72.5	52.4	-12.9	187.1	72.5	0	9.8	0	14.4
Jun-88	92.6	48.2	-37	152.5	90.3	2.4	0	0	8.3
Jul-88	123.5	61.2	-65.3	102.7	108	15.5	0	0	6
Aug-88	97.4	73	-28.1	88.2	83.8	13.7	0	0	5.1
Sep-88	51.3	106.1	49.5	137.7	51.3	0	0	0	6
Oct-88	23.9	91.3	62.9	200	23.9	0	0	0.6	5.2
Nov-88	15.5	98.5	78.2	200	15.5	0	0	78.2	44.3
Dec-88	8.4	23.2	2.8	200	8.4	0	11.6	2.8	21.5
Jan-89	9.6	33	11	200	9.6	0	23.3	11	16.8
Feb-89	8.2	2	-6.9	193.1	8.2	0	24	0	8
Mar-89	15.6	39	10.2	200	15.6	0	36.3	3.3	6.5
Apr-89	31.5	44.7	29.1	200	31.5	0	18.2	29.1	19.6
May-89	64.5	106.2	45.5	200	64.5	0	9.1	45.5	36.8
Jun-89	97.4	132	37.1	200	97.4	0	0	37.1	40.9
Jul-89	112.5	26.2	-87.6	112.4	112.5	0	0	0	18.5
Aug-89	86.6	100.6	9	121.3	86.6	0	0	0	13.6
Sep-89	51.7	39.7	-13.9	112.9	46.2	5.5	0	0	6.3
Oct-89	28.6	71.6	39.4	152.3	28.6	0	0	0	5.7
Nov-89	12.8	140.6	101.5	200	12.8	0	21	53.8	33.3
Dec-89	5.5	2	-5.5	194.5	5.5	0	23	0	14
Jan-90	10.3	37	18.9	200	10.3	0	29.8	13.4	14.7
Feb-90	10	26.2	6.1	200	10	0	39.5	6.1	10.3
Mar-90	19.7	52.4	35.3	200	19.7	0	35	35.3	24.5
Apr-90	39.9	46.6	21.9	200	39.9	0	17.5	21.9	24.6
May-90	60.2	123.4	65.8	200	60.2	0	8.8	65.8	50.2
Jun-90	96.8	109.8	16.3	200	96.8	0	0	16.3	35.7
Jul-90	107.1	80.4	-30.7	169.3	107.1	0	0	0	19.1
Aug-90	88.8	88.1	-5.1	165	88	0.8	0	0	11.9

Sep-90	51.3	90.9	35	200	51.3	0	0	0	8.3
Oct-90	27.5	134.4	100.2	200	27.5	0	0	100.2	58.7
Nov-90	15.7	73.5	54.1	200	15.7	0	0	54.1	56.7
Dec-90	9.6	70	35.5	200	9.6	0	22.9	35.5	46.2
Jan-91	7.6	3.8	-4.9	195.1	7.6	0	24.1	0	22.2
Feb-91	10.8	29.8	10.1	200	10.8	0	32.3	5.1	14.3
Mar-91	19.9	97.6	68.5	200	19.9	0	38	68.5	44.6
Apr-91	39.9	133.6	106.1	200	39.9	0	19	106.1	80.2
May-91	81.6	65.6	-9.8	190.2	81.6	0	9.5	0	40.1
Jun-91	104.9	44.1	-53.5	139.4	102.3	2.6	0	0	20.6
Jul-91	111.8	93	-23.5	123	104.7	7.1	0	0	13.8
Aug-91	95.1	76.6	-22.3	109.3	86.5	8.6	0	0	8.4
Sep-91	48.9	51.1	-0.3	109.1	48.7	0.1	0	0	4.9
Oct-91	30.6	100.2	64.6	173.7	30.6	0	0	0	6.2
Nov-91	13.2	48.6	33.4	200	13.2	0	0	7.1	6.1
Dec-91	8.8	17.5	8.3	200	8.8	0	0	8.3	6.6
Jan-92	8.6	9	0.3	200	8.6	0	0	0.3	3.4
Feb-92	10	33.2	4.1	200	10	0	18.5	4.1	4.2
Mar-92	16.5	45.6	15.3	200	16.5	0	31.2	15.3	10.6
Apr-92	32.5	107.2	85	200	32.5	0	15.6	85	52.6
May-92	63.3	85.6	25.9	200	63.3	0	7.8	25.9	40.8
Jun-92	81.8	55.4	-21.4	178.6	81.8	0	0	0	21
Jul-92	90.6	126.6	29.7	200	90.6	0	0	8.3	19.6
Aug-92	76.5	173.8	88.6	200	76.5	0	0	88.6	59.6
Sep-92	50.4	91.4	36.4	200	50.4	0	0	36.4	48.3
Oct-92	24.6	46.6	19.6	200	24.6	0	0	19.6	34
Nov-92	13.5	152.2	117	200	13.5	0	15.4	117	80.6
Dec-92	9.3	23.6	9	200	9.3	0	20.1	9	42.3
Jan-93	8.5	39.4	9.9	200	8.5	0	40.5	9.9	26.4
Feb-93	7.2	0	-7.2	192.8	7.2	0	40.5	0	12.9
Mar-93	15.5	0.2	-6.9	186.2	15.2	0.2	32	0	6.5
Apr-93	35	72.1	49.5	200	35	0	16	35.7	24.7
May-93	61.7	61.6	4.8	200	61.7	0	8	4.8	16
Jun-93	87.6	111.4	26.2	200	87.6	0	0	26.2	25.2
Jul-93	111.8	80.4	-35.4	164.6	111.8	0	0	0	13.8
Aug-93	93.3	54.4	-41.6	130.3	85.9	7.4	0	0	7.6
Sep-93	44.5	68.8	20.8	151.2	44.5	0	0	0	5.9
Oct-93	25.9	70.3	40.9	192.1	25.9	0	0	0	4.7
Nov-93	13.5	58.4	36.6	200	13.5	0	5.9	28.6	17.3
Dec-93	8.7	12	-1.2	198.8	8.7	0	10.2	0	7.7
Jan-94	5.2	28.5	-5.2	193.7	5.1	0	38.7	0	3.7
Feb-94	7.3	0	-7.3	186.6	7.1	0.2	38.7	0	1.9
Mar-94	16.9	12.4	1	187.6	16.9	0	32.8	0	1.3
Apr-94	36.5	80.4	56.2	200	36.5	0	16.4	43.9	26.4
May-94	58.7	107.6	51.7	200	58.7	0	8.2	51.7	42.4
Jun-94	98	49.4	-42.8	157.2	98	0	0	0	21
Jul-94	111.1	54.7	-59.2	110.7	98.5	12.7	0	0	12
Aug-94	80.4	50	-32.9	92.5	65.7	14.7	0	0	7.1
Sep-94	51	63	8.8	101.3	51	0	0	0	5.5

Oct-94	28.7	59.5	27.8	129.1	28.7	0	0	0	4.1
Nov-94	16	59.2	40.2	169.3	16	0	0	0	3.5
Dec-94	10	18.4	7.9	177.1	10	0	0	0	0.8
Jan-95	9.3	69.9	26.1	200	9.3	0	33.1	3.2	3.2
Feb-95	7.9	6	-6.9	193.1	7.9	0	38.1	0	0.9
Mar-95	20.1	1.4	-4.9	188.3	19.9	0.2	24.3	0	0.5
Apr-95	29.1	90	63.9	200	29.1	0	17.2	52.3	30.5
May-95	63.7	76.2	17.3	200	63.7	0	8.6	17.3	25.7
Jun-95	103.6	79.8	-19.2	180.8	103.6	0	0	0	14.9
Jul-95	114.6	65.9	-52	133.8	109.6	5	0	0	8.8
Aug-95	98.7	62.2	-39.6	107.3	85.6	13.1	0	0	5.8
Sep-95	47.1	45.4	-3.9	105.2	45.2	1.8	0	0	3.6
Oct-95	31	146.3	108	200	31	0	0	13.2	14.6
Nov-95	11.7	105.2	65.6	200	11.7	0	24.5	65.6	39.9
Dec-95	7.3	0	-4.7	195.3	7.3	0	21.8	0	18.2
Jan-96	7.2	50.8	0.3	195.6	7.2	0	65	0	9.3
Feb-96	8.8	33.4	5.2	200	8.8	0	84	0.8	5.3
Mar-96	15.3	4.8	4.2	200	15.3	0	69.2	4.2	4.7
Apr-96	29.8	80.8	77.7	200	29.8	0	38.7	77.7	45
May-96	59.5	93	48.2	200	59.5	0	19.3	48.2	49.3
Jun-96	98.6	149.2	52.8	200	98.6	0	9.7	52.8	56.2
Jul-96	100.6	112.4	15.8	200	100.6	0	0	15.8	37.9
Aug-96	90.5	52	-41.1	158.9	90.5	0	0	0	18.7
Sep-96	52.3	155.1	95	200	52.3	0	0	54	42.8
Oct-96	27.9	65.2	34.1	200	27.9	0	0	34.1	37.8
Nov-96	12.1	33.6	13.6	200	12.1	0	6.8	13.6	25.2
Dec-96	10.1	63.2	35.7	200	10.1	0	22.3	35.7	31.8
Jan-97	7.3	25.5	-1.7	198.3	7.3	0	42.1	0	15.1
Feb-97	10.4	55.6	23.9	200	10.4	0	62.4	22.2	19.6
Mar-97	16.5	39	22.2	200	16.5	0	61.7	22.2	21.4
Apr-97	32.7	26.6	23.4	200	32.7	0	30.8	23.4	23.2
May-97	50.9	90.8	50.8	200	50.9	0	15.4	50.8	40.9
Jun-97	105.5	79.7	-22.1	177.9	105.5	0	7.7	0	22.1
Jul-97	105.1	58.3	-42	140.5	100.5	4.6	0	0	12
Aug-97	79.4	72.5	-10.5	133.1	76.3	3.1	0	0	8.2
Sep-97	52.3	63.7	8.2	141.3	52.3	0	0	0	5.5
Oct-97	27.5	31.6	2.5	143.8	27.5	0	0	0	2.7
Nov-97	13.1	32.6	18.2	162.1	13.1	0	0	0	1.9
Dec-97	9.6	13	3.1	165.1	9.6	0	0	0	0.6
Jan-98	9.4	71.2	27.3	192.4	9.4	0	33.1	0	1.6
Feb-98	12.3	30.8	18	200	12.3	0	32.7	10.4	6.2
Mar-98	19.7	71.8	48	200	19.7	0	34.2	48	29.2
Apr-98	38.2	39.2	16.2	200	38.2	0	17.1	16.2	23.4
May-98	83.6	56.7	-21.2	178.8	83.6	0	8.6	0	13.5
Jun-98	96.2	57	-33.4	148.9	92.6	3.5	0	0	8.2
Jul-98	107.7	47.8	-62.3	102.5	91.8	15.9	0	0	5.1
Aug-98	92.2	96.4	-0.6	102.2	91.9	0.3	0	0	6.2
Sep-98	55.7	44	-13.9	95.1	48.9	6.8	0	0	2.9
Oct-98	28.9	13.6	-16	87.5	20.5	8.4	0	0	1

Nov-98	14.9	40.6	23.8	111.3	14.9	0	0	0	2.1
Jan-99	7.2	37	-2.5	109.9	6.1	1.1	32.1	0	0.3
Jul-99	128.2	63.4	-51.9	81.4	104.8	23.4	16.1	0	3.2
Aug-99	83.4	70.7	-8.2	78.1	78.6	4.9	8	0	3.6
Sep-99	56	71.6	20.1	98.1	56	0	0	0	3.6
Oct-99	27.9	63.1	32.1	130.2	27.9	0	0	0	3.2
Nov-99	16.2	75.4	55.4	185.6	16.2	0	0	0	3.8
Dec-99	9.6	42	17.2	200	9.6	0	14	2.8	2.6
Jan-00	8	30.6	2.5	200	8	0	33.8	2.5	2.3
Feb-00	11	25	10.1	200	11	0	37.2	10.1	6.6
Mar-00	23.3	35.1	25.6	200	23.3	0	21.7	25.6	17.5
Apr-00	33.9	56	30.1	200	33.9	0	10.8	30.1	25.8
May-00	69.9	164.9	92.2	200	69.9	0	5.4	92.2	65.8
Jun-00	96.2	219	117.3	200	96.2	0	0	117.3	98.4
Jul-00	98.8	91.2	-12.1	187.9	98.8	0	0	0	48.3
Aug-00	85	68.4	-20	169	83.8	1.2	0	0	25.3
Sep-00	52.3	110.6	52.8	200	52.3	0	0	21.8	27.4
Oct-00	31.4	29.6	-3.2	196.8	31.4	0	0	0	12.4
Nov-00	13.9	51.4	35.3	200	13.9	0	0	32	23.7
Dec-00	6.6	0	-6.6	193.4	6.6	0	0	0	10.7
Jan-01	8.6	0	-8.6	185.1	8.3	0.3	0	0	5.4
Feb-01	9.9	34	4	189.1	9.9	0	19.6	0	3.2
Mar-01	17.1	6	-8	181.6	16.7	0.4	16.3	0	1.5
Apr-01	37.7	40	8.5	190	37.7	0	8.1	0	2.7
May-01	70.7	79.2	12.7	200	70.7	0	0	2.7	5.6
Jun-01	96.8	94.4	-7.1	192.9	96.8	0	0	0	5.6
Jul-01	101.9	73.6	-32	162.1	100.8	1.1	0	0	4.1
Aug-01	99.3	48.6	-53.1	119.1	89.2	10.1	0	0	2.6
Sep-01	52.3	84.4	27.9	146.9	52.3	0	0	0	4.3
Oct-01	28.9	147.9	111.6	200	28.9	0	0	58.5	36.7
Nov-01	17.9	85.6	63.4	200	17.9	0	0	63.4	50.6
Dec-01	11	20	8.2	200	11	0	0	8.2	28
Jan-02	10.4	1	-9.4	190.6	10.4	0	0	0	13.7
Feb-02	11.3	29.8	5.9	196.5	11.3	0	12	0	7.5
Mar-02	18.5	38.1	12.8	200	18.5	0	17.5	9.3	9.3
Apr-02	36.8	102.5	69.4	200	36.8	0	8.8	69.4	43.8
May-02	55.5	111.4	59	200	55.5	0	0	59	54.4
Jun-02	98	74.8	-26.9	173.1	98	0	0	0	28.2
Jul-02	125	66.6	-61.8	119.7	116.7	8.3	0	0	15.5
Aug-02	94.5	35	-61.2	83	69.9	24.6	0	0	7.9
Sep-02	63.4	52.5	-13.5	77.4	55.5	7.9	0	0	5.7
Oct-02	25.9	78	48.2	125.6	25.9	0	0	0	5.4
Nov-02	13.3	30	15.5	141.1	13.3	0	0	0	2
Dec-02	8.9	11	1.8	142.9	8.9	0	0	0	0.6
Jan-03	6.6	0	-6.6	138.2	4.7	1.9	0	0	0.2
Feb-03	7.7	13	-7.4	133.1	5.4	2.3	12.7	0	0.1
Mar-03	17.6	25.8	3.4	136.4	17.6	0	16.7	0	0.8
Apr-03	32.3	24.6	-0.5	136.1	32.1	0.2	8.4	0	1.3
May-03	61.3	95.6	37.9	173.9	61.3	0	0	0	4.8

Jun-03	95	77.3	-21.5	155.2	92.2	2.8	0	0	3.9
Jul-03	109.1	38.8	-72.2	99.2	92.9	16.2	0	0	1.9
Aug-03	95.1	99.9	-0.1	99.1	95	0.1	0	0	5
Sep-03	53.3	107.8	49.1	148.2	53.3	0	0	0	5.4
Oct-03	26.4	94.6	63.5	200	26.4	0	0	11.7	10.6
Nov-03	15.5	94.4	74.3	200	15.5	0	0	74.3	44.7
Dec-03	9.7	45.6	20.3	200	9.7	0	14.3	20.3	31.5
Jan-04	6.2	9.2	-6.2	193.8	6.2	0	23.5	0	15.1
Feb-04	9.8	1	-5.8	188.2	9.6	0.2	20.5	0	7.6
Mar-04	20	98	65.1	200	20	0	29.9	53.3	34
Apr-04	34.8	66.3	43.2	200	34.8	0	15	43.2	40.1
May-04	64.5	117	54.2	200	64.5	0	7.5	54.2	51.3
Jun-04	89.3	57.5	-27.2	172.8	89.3	0	0	0	25.6
Jul-04	104.4	116.7	6.4	179.3	104.4	0	0	0	17.2
Aug-04	78.9	60.8	-21.2	160.3	76.7	2.2	0	0	8.7
Sep-04	57.8	39.7	-20	144.2	53.8	4	0	0	4.8
Oct-04	28.7	58.4	26.7	171	28.7	0	0	0	4.3
Nov-04	15.2	63.9	45.6	200	15.2	0	0	16.6	12.1
Dec-04	8	33.5	6	200	8	0	19	6	8
Jan-05	7.1	29	-3.3	196.7	7.1	0	44.1	0	3.8
Feb-05	9.6	31.2	8.3	200	9.6	0	56.9	5	4.8
Mar-05	16.1	14	5.1	200	16.1	0	49.4	5.1	5.1
Apr-05	35.4	57.1	43.5	200	35.4	0	24.7	43.5	27
May-05	56.2	47.2	1	200	56.2	0	12.3	1	14.9
Jun-05	118.7	32.3	-81.9	118.1	118.7	0	6.2	0	7.9
Jul-05	121.2	141.7	19.6	137.7	121.2	0	0	0	10.2
Aug-05	95.6	148.3	45.2	183	95.6	0	0	0	9
Sep-05	59.2	76.6	13.6	196.5	59.2	0	0	0	4.6
Oct-05	30.4	51	18.1	200	30.4	0	0	14.6	10.2
Nov-05	15.5	95.9	75.7	200	15.5	0	0	75.7	46.4
Dec-05	8.1	23.3	2.1	200	8.1	0	12.6	2.1	22.3
Jan-06	10.8	79.3	46.7	200	10.8	0	32.1	46.7	36.6
Feb-06	9.5	36	7.3	200	9.5	0	50.9	7.3	21.3
Mar-06	18.8	59.9	41.9	200	18.8	0	48.2	41.9	33.3
Apr-06	37.5	93.6	75.6	200	37.5	0	24.1	75.6	58.1
May-06	68.6	106.1	44.3	200	68.6	0	12	44.3	54.2
Jun-06	99.2	53.9	-42	158	99.2	0	6	0	27.1
Jul-06	122.7	100.4	-21.3	141.2	118.2	4.5	0	0	17.2
Aug-06	90.5	52.6	-40.5	112.6	78.6	11.9	0	0	8.7
Sep-06	49.8	163.3	105.4	200	49.8	0	0	18	20.2
Oct-06	26.9	120.2	87.3	200	26.9	0	0	87.3	55.7
Nov-06	16.3	50.8	31.9	200	16.3	0	0	31.9	43.3
Dec-06	11.6	36.6	23.6	200	11.6	0	0	23.6	33.6
	529	725	163	2141	516	13	142	175	207

ENCLOSURE 3

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

July 7, 2020 Project No. 20145732

Mr. Daniel Oh, PEng, PMP
Town of Caledon
Planning and Development
6311 Old Church Road
P.O. Box 1000
Caledon, ON
L0N 1E0

HYDROGEOLOGICAL PEER REVIEW
HYDROGEOLOGICAL IMPACT STUDY OF MOUNT PLEASANT ROAD TROPICAL LAND SUBDIVISION, TOWN OF CALEDON, ONTARIO

Dear Mr. Oh,

This letter provides our peer review of the report entitled:

- Hydrogeological Impact Study Proposed New Sub-Division 0 Mount Pleasance Road, Town of Caledon, Ontario, Prepared by Sirati & Partners Consultants Limited, dated October 17, 2019.

The following related report was also reviewed:

- Nitrate Impact Assessment Report Proposed New Sub-Division 0 Mount Pleasant Road, Town of Caledon, Ontario, prepared by Sirati & Partners Consultants Limited, dated September 10, 2019.

The reports are considered to be prepared by qualified persons as the authors are professional geoscientists.

Scope of Work

The scope of work stated in the IRFQ is as follows:

1) Adequacy of the Study:
   - Has the study been prepared by a qualified expert?
   - Have all applicable MECP tests, guidelines, policies, and procedures been addressed as part of the study?
   - Does the peer reviewer agree with the conclusions and recommendations presented in the study?

2) Adequacy of Water Supply:

   – Have any short term and long-term potential impacts to groundwater quantity and quality for the down gradient private water supply wells as a result of the proposed development been identified?
   – If potential impacts have been identified for private wells, are the proposed mitigation measures acceptable?

3) Other Considerations:

   – A Peer Review Letter will be provided, which contains concluding statement of the adequacy of the hydrogeological study in accordance with the applicable requirements listed above.

Hydrogeological Work Program

The hydrogeological work program included the following.

- Review of available background information;
- Detailed site inspection;
- Measurement of groundwater levels;
- In-situ hydraulic conductivity tests;
- Private water well survey;
- Water balance; and
- Reporting.

A nitrate impact assessment report was provided under separate cover.

Background

The hydrogeological report indicates that the property consists of a 12.28 hectare parcel of land extending approximately 678.5 metres along Mount Pleasant road. The property consists of cultivated undeveloped land with no structures. The proposed development is comprised of eight (8) single detached custom homes with one-level basements on eight (8) development lots. The source of water for the proposed developments is from the Palgrave municipal supply wells and serviced by private septic systems.

The southwest portion of the property is located in a wellhead protection area (WHPA) of the Palgrave Municipal Well System, with a 25-year time of travel and a vulnerability score of 4 out of 10. The assessment of the potential affects of the proposed development on the Palgrave Municipal Well System is not included in the scope of this peer review.

Geological Setting

The site is located in the Oak Ridges Moraine area, which consists of glacial deposits comprised of ice-contact stratified deposits including sand and gravel deposits, with tills as well as eskers, kame, end moraine, ice contact delta and subaqueous fan deposits.

The soil deposits consisted of topsoil with or without fill materials underlain by: sand, then silty sand, silt and sand or sandy silt, locally with silt or clayey silt to silty clay, based in the results of borehole drilling as part of a geotechnical investigation by Sirati & Partners (as indicated in the hydrogeological report).

Borehole Drilling and Monitoring Well Installations

A total of eight (8) boreholes were drilled at the site to depths ranging between 8.2 mbgs (metres below ground surface) and 11.2 mbgs, as part of a geotechnical investigation (by Sirati & Partners). Monitoring wells were installed in five (5) of the boreholes.

Groundwater Levels and Flow Directions

Groundwater levels were measured in the monitoring wells on June 16 and June 17, 2017. Groundwater level monitoring was then conducted over a six-month period from October 2017 to March 2018.

The measured groundwater levels ranged from 4.41 mbgs in monitoring well MW4 to 10.30 mbgs in monitoring well MW2 in February 2018. The groundwater elevations ranged between 282.3 mASL at MW 1 in October 2017 and 288.2 mASL at MW6 in November 2017.

Groundwater elevation contour plans are presented on Figures 10-1 to 10-6 in the hydrogeological report. The inferred direction of groundwater flow is toward the east and west away from the highest groundwater elevation in MW6 in the central area of the site. The flow directions are not directly towards the closest private water wells situated to the north of the site.

Hydraulic Conductivity Tests

Slug tests were performed at two monitoring wells (MW2 and MW4) to analyze the hydraulic conductivity of the screened formations. The reported hydraulic conductivity estimates are 5.23×10^{-6} m/s at MW2 and $7.70\ 10^{-6}$ m/s at MW4. These values are typical for the screened geological deposits as noted in the report.

Groundwater Quality Sampling

Groundwater samples were collected from three (3) monitoring wells and analyzed for a suite of parameters for comparison with Ontario Drinking Water Standards (ODWS) Aesthetic Objectives and Operational Guidelines. The results indicated exceedances for aluminum, iron, manganese, total hardness, and durability, as well as nitrite at one (1) location for unfiltered samples.

The report notes that the water supply for the site is from the Palgrave municipal water supply system and as such the water quality analyses do not pertain to the water supply for the site. However, the results provide background groundwater quality for the site.

Private Water Well Survey

The hydrogeological study identified seventeen water wells within a 500 m radius of the property (shown on Figure 6-1 of the report). The wells were screened from bottom depths ranging between 10 mbgs and 80.4 mbgs in sand deposits. All wells were installed in glacial deposits and no wells were encountered bedrock.

The closest wells (wells #4903748 and #4907241) to the site are located approximately 300 m northwest of the site. Well #4903798 is screened between 56.4 mbgs and 57.9 mbgs in coarse sand with a static water level of 21.3 mbgs. Well #4907241 was screened between 56.1 mbgs and 57.3 mbgs in sand with a static water level of 26.7 mbgs. The report notes the presence of private property to the north of the site and that it appears that a well (#4904792) is associated with this property. This well was drilled to a depth of 43 mbgs and screened between 39.7 mbgs and 41.5 mbgs with a static water level of 22.7 mbgs.

A hydrogeological cross-section based on water well information is shown on Figure 6-2 of the report, which indicated that wells are screened in sand deposits below a silt layer that is interpreted to extend across the site.

Potential Impacts related to Significant Groundwater Recharge Area (SGRA) and Highly Vulnerable Aquifer (HVA) Areas

The hydrogeological report assessed the potential impacts related to Significant Groundwater Recharge Area (SGRA) and Highly Vulnerable Aquifer (HVA) areas. The property is located in an area identified as a Significant Groundwater Recharge Area (SGRA), which are areas where recharge is 15% higher than the average recharge within a particular area. It may be desirable to regulate or monitor drinking water trends within these areas. The southwest portion of the property is located in an area identified as a highly vulnerable aquifer (HVA). The HVA classification relates to the potential for sources of surface contamination to impact the aquifer due to the presence or absence of a protective cover above the aquifer.

The hydrogeological report provides the following recommendations to protect and preserve the SGRAs and the HVAs.

- Incompatible land uses such as storage of chemicals and/or liquids should be avoided and directed away from the SGRA.
- Existing and post-development groundwater recharge conditions should be maintained by means of implementing low-impact development (LID) measures.
- Since the proposed development is a major development (>500m^2) within the SGRA, an Infiltration Management Plan that demonstrates pre-development recharge rates will be maintained is a requirement.
- A Contaminant Management Plan might be a requirement within the HVAs, as the development is a ‘major development’.

- Promote awareness of the importance of SGRAs and HVAs by means of sign boards explaining the linkage between surface activities and their impact on groundwater quality and quantity.
- A salt management plan may be required to be developed and implemented.

We agree with these general recommendations concerning groundwater protection.

Potential for Construction Dewatering Impacts

The hydrogeological report evaluated the potential impacts of construction dewatering. The report notes that the excavations for construction of the basements for the proposed development will extend to a depth of about three (3) metres below the ground surface, which is shallow compared to the depth of the aquifers.

We note however that these basements may be excavated through the protective cover of low permeability glacial deposits during the excavation of the basements and care should be take during this period that contamination is not introduced that could migrate into the aquifer. The results of borehole drilling have indicated that the fine-grained deposits extend to the depth of the basement excavations, which should afford a degree of aquifer protection. However, this does not demonstrate this condition exists at the location of each basement excavation. In the event that the basement excavations extend through the fine-grained surficial deposits into the aquifer deposits, which is not anticipated, then groundwater protection measures should be implemented during construction to prevent aquifer contamination.

The report indicated that the groundwater levels will be below the base of the basement elevations and that construction dewatering will not be required and therefore there will be no impacts. We agree with this statement as long as the excavations do not extend into the water table or into the aquifer deposits. If they do extend into the water table then a water taking permit from the MECP may be required for dewatering groundwater. In addition, if the basement excavations do extend into the groundwater table then monitoring of private water wells may be required to ensure that their supply is not affected by the groundwater level drawdown induced by dewatering of the excavations.

Water Balance

A preliminary water balance was conducted separately for the pre-development and post-development conditions for the two catchments of the proposed development in accordance with the “Hydrogeological Assessment Submission” Conservation Authority Guidelines for Development Applications dated June 2013. The methodology of the water balance is considered to be appropriate. The results of the water balance for Catchment 1 indicate the following changes from the pre-development to post-development conditions.

- A 64 percent increase in site runoff from 9,223 m^3/annum to 14,926 m^3/annum due to the increased impervious areas of the site such as roof and paved areas and reduction in pervious area.
- A 17% or 1867m^3/annum decrease in infiltration from 11,138 m^3/annum to 9,271 m^3/annum.

The report noted a volume of 1338 m^3/annum that can be collected from the roof areas in Catchment 1 that can be used for enhanced infiltration associated with Low impact Development (LID) measures. The report notes that this volume is not sufficient to compensate for the total infiltration deficit and extra sources should be considered.

The results of the reported calculations for Catchment 2 from pre-development to post-development are summarized below.

- A 19% increase in runoff corresponding to 1,446 m^3/annum, from 7,565 m^3/annum to 8,882 m^3/annum.
- A 5% decrease in post-development infiltration corresponding from 9,246mm^3/annum to 8,822/annum, corresponding to a net deficit of about 423 m^3/annum.

The report notes that there is a net volume at 489 m^3/annum that could be collected from the roof areas in Catchment 2 and used for low impact development measures.

In summary, the report indicates an estimated infiltration deficit of 2,290 m^3/annum for the entire site. The report notes that the author (Sirati) is not responsible for providing design of LID techniques and as such these are not considered further within this peer review.

Nitrate Impact Assessment

A nitrate impact assessment was conducted and documented in a separate report. The background calculations are based on nitrate concentrations from MW2 and MW4 during two rounds of groundwater sampling. Well MW1, which has a high nitrate concentration was noted to be excluded from the background calculation as it was outside of the proposed eight (8) residential development lots, which is considered to be acceptable. The background nitrate concentration was calculated to be 3.52 mg/L.

The nitrate dilution calculations assume:

- 8 proposed lots;
- Daily Effluent Flow/Lot of 1,000 L/day;
- Development Area of 117 ha;
- Infiltration rate of 0.20 m/year;
- Nitrate loading per dwelling of 40 g/day; and
- Impervious surface of 20 percent.

The results of the calculation indicate 5.64 mg/L of nitrate will be added to the background groundwater nitrate concentration. An appropriate nitrate dilution calculation was applied assuming 80% of the site as previous and water contributing, a background nitrate concentration of 3.52 mg/L, and a septic effluent nitrate concentration of 40 mg/L (which is conservative for Class 4 treatment).

The calculated concentration of nitrate at the property boundary is 8.24 mg/L. The report indicates that the Reasonable Use Policy (RUP) guidelines is met, since the results are below the Reasonable Use Guideline of 10mg/L. We agree with the methodology and results and conclusion that the results of the nitrate impact assessment are below the guidelines. Accordingly, there are no predicted nitrate impacts on surrounding water wells.

Conclusions

The following conclusions are provided based on our peer review.

1) The hydrogeological report provides an adequate characterization at the site based on borehole drilling, soils logging, monitoring well installations, hydraulic conductivity testing, groundwater level monitoring and interpretation of flow diversions, a pre-development and post-development water balance, water quality sampling and analysis, and a nitrate impact assessment

2) The water supply, for the proposed development is considered to be adequate since it will be from the Palgrave Municipal System and not private wells.

3) The property is located in an area identified as a Significant Groundwater Recharge Area (SGRA). The southwest portion of the property is located in an area identified as a highly vulnerable aquifer (HVA). The hydrogeological report provides the following recommendations to protect and preserve the SGRAs and the HVAs.

   - Promote awareness of the importance of SGRAs and HVAs by means of sign boards explaining the linkage between surface activities and their impact on groundwater quality and quantity.
   - An Infiltration Management Plan, that demonstrates pre-development recharge rates will be maintained, is a requirement, since the proposed development is a major development (>500 m^2) within the SGRA.
   - Existing and post-development groundwater recharge conditions should be maintained by means of implementing low-impact development (LID) measures.
   - Incompatible land uses such as storage of chemicals and/or liquids should be avoided and directed away from the SGRA.
   - A Contaminant Management Plan might be a requirement within the highly vulnerable aquifers, as the development is a major development.
   - A salt management plan may be considered to be developed and implemented.

We agree with these recommended groundwater protection measures.

1) There are no anticipated impacts on wells or open water bodies, related to construction dewatering since the planned basement excavations are above the groundwater levels and no groundwater dewatering is expected to be required. If the excavations do extend into the water table then a water taking permit from the MECP may be required for pumping groundwater. In addition, if the basement excavations do extend into the groundwater table then monitoring of private water wells may be required to ensure that their supply is not affected by the groundwater level drawdown due to dewatering of the excavations.

2) The water balance indicates that there will be infiltration deficit of 2.290 m^3/annum for the entire site. The report notes that there is a net volume at 489 m^3/annum that could be collected from the roof areas and used for low impact development measures. As such, we agree that the infiltration deficit cannot be offset by mitigation by infiltrating water from roof areas.

3) The results of the nitrate calculations in accordance with Reasonable use Policy (RUP) indicate a predicted nitrate concentration at 8.64 mg/L at the site boundary. The assessment of potential nitrate impacts was carried out in accordance with Technical Guideline D-5-5 (Ministry of the Environmental, 1996) and the Ontario Building Code (Ministry of Municipal Affairs and Housing 2011, as amended). Accordingly, no predicted short term and long term potential impacts to groundwater quality, related to down gradient private water supply wells, as a result of the proposed development, have been identified since the results of the nitrate concentrations at the property boundary are below the applicable guidelines. Therefore, no mitigation measures are required based on the hydrogeological report.

4) The applicable MECP tests, guidelines, policies, and procedures been addressed as part of the study.

5) We agree with the conclusions and recommendations provided in the hydrogeological report.

Recommendations

The following recommendations are provided based on our peer review.

1) In the event that groundwater is encountered in the basement excavations, then monitoring should be conducted in the surrounding water wells to ensure that the quantity of their supply is not affected. If the quantity is affected, then appropriate mitigation should be implemented to restore the supply.

2) In the event that the basement excavations extend through the fine-grained surficial deposits into the aquifer deposits, which is not anticipated, then groundwater protection measures should be implemented during construction to prevent aquifer contamination.

3) Additional mitigation could be considered to offset the infiltration deficit beyond infiltration of water from roofed areas as part of Low impact Development (LID) measures.

4) The designers of the proposed development should consider the suggested measures for groundwater protection described in the hydrogeological report.

Closure

We trust that this peer review meets your requirements and if you have any questions or require clarification, please contact us.

Golder Associates Ltd.

Dr. Sean McFarland, PGeo
Senior Hydrogeologist, Principal

SM/sm/ll/cg/wlm

https://golderassociates.sharepoint.com/sites/128892/project files/7 correspondence/letters-tech memos/20145732-l-rev0 07jul2020-peer review.docx