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PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT
NEW PROPERTY IN CALEDON
PART OF WEST HALF OF LOT 18, CONCESSION 2
WEST OF HURONTARIO STREET
TOWN OF CALEDON, ONTARIO

Submitted to:

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Submitted by:

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19 December 2002

TB02016G

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RECORD OF BOREHOLES

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1. INTRODUCTION

AMEC Earth and Environmental Limited, Consulting Geotechnical, Construction Quality Control and Environmental Engineers, was retained by Guglietti Brothers Investments Limited to conduct a preliminary geotechnical investigation for a proposed residential development at 2068 Mayfield Road located at the north-east corner of Mayfield Road and Chinguacousy Road, in the Town of Caledon, Ontario. The site location is shown on Figure 1.

The purpose of this preliminary geotechnical investigation was to obtain information about the subsurface conditions at the site by means of a number of boreholes, in-situ tests and laboratory tests on selected samples. Based on our interpretation of the data obtained, recommendations are provided on the geotechnical design aspects of the proposed subdivision.

Authorization to proceed with this investigation was received from Mr. Silvio Guglietti, General Manager of Guglietti Brothers Investments Limited on 05 November, 2002. The work carried out for this investigation was completed in accordance with AMEC's proposal (ref. no. P02020G, dated 05 November, 2002).

This report contains the findings of our preliminary geotechnical investigation, together with our recommendations and comments. These recommendations and comments are based on factual information and are intended only for use of the design engineers. The number of boreholes may not be sufficient to determine all the factors that may affect construction methods and costs. Subsurface and groundwater conditions between and beyond the boreholes may differ from those encountered at the borehole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The anticipated construction conditions are also discussed, but only to the extent that they may influence design decisions. Construction methods discussed, however, express our opinion only and are not intended to direct the contractors on how to carry out the construction. Contractors should also be aware that the data and their interpretation presented in this report may not be sufficient to assess all the factors that may have an effect upon the construction.

The report was prepared with the assumption that the design will be in accordance with all applicable standards and codes, regulations of authorities having jurisdiction, and good engineering practice. Further, the recommendations and opinions in this report are applicable only to the proposed project as described above.

We recommend on-going liaison with AMEC Earth and Environmental Limited during the construction phase of the project to ensure that the recommendations in this report are applicable and/or correctly interpreted and implemented. Also, any queries concerning the geotechnical aspects of the proposed project should be directed to AMEC Earth and Environmental Limited for further elaboration and/or clarification.

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2. INVESTIGATION PROCEDURES

The fieldwork for the investigation was carried out on 5 and 6 December, 2002, and consisted of drilling sixteen (16) boreholes (Boreholes 1 to 16) to a depth of 5 m below the existing ground surface.

The boreholes were advanced using solid stem continuous flight augers, with track-mounted power auger drilling rig, under the full-time supervision of experienced geotechnical personnel from AMEC Earth & Environmental Limited. Soil samples were taken at 0.76 m intervals for the depths above 3 m and 1.5m intervals below this depth and the Standard Penetration Test (SPT) was performed in accordance with ASTM D1586. This consists of freely dropping a 63.5 kgs. (140 lbs.) hammer a vertical distance of 0.76 m (30 inches) to drive a 51 mm (2 inches) diameter o.d. split-barrel (split spoon) sampler into the ground. The number of blows of the hammer required to drive the sampler into the relatively undisturbed ground by a vertical distance of 0.30 m (12 inches) is recorded as SPT 'N' value of the soil and this gives an indication of the consistency or the relative density of the soil deposit. It should be noted that cobbles and/or boulders, if encountered, could not be sampled with the split-spoon sampler

Upon completion of boreholes, the soil samples were transported to our geotechnical laboratory in Scarborough Office for further examination and classification. Laboratory tests of natural moisture content determinations were performed on selected representative soil samples. The results of the in-situ and laboratory tests are presented on the appropriate Record of Borehole Sheets.

The borehole locations shown on Figure 2 established in the field by our field personnel are approximate locations only.

Soil samples will be retained for a period of three months, and will be disposed of on 17 March, 2003 unless we are otherwise instructed.

3. SUB-SURFACE CONDITIONS

Based on soil conditions explored within the 16 boreholes (Boreholes 1 to 16), the soil profile consists primarily of topsoil overlying clayey silt till underlain by sandy silt till, silty sand, silt and silty clay till. The stratigraphic units and ground water conditions are discussed in details in the following sections. For more information, reference should be made to the Record of Borehole Sheets. Please note that the following summary is to assist the designers of the project with an understanding of the anticipated soil conditions across the site. However, it should be noted that the soil and groundwater conditions only confirmed at borehole locations will vary between these locations.

3.1 Topsoil

All boreholes encountered topsoil with thickness approximately between 0.15 m and 0.3 m.

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It should be noted that in our experience the thickness of topsoil could vary considerably in between and beyond borehole locations and thicker topsoil are normally expected in low-lying areas and water courses. Possible variations should therefore be taken into account when estimating quantities.

3.2 Clayey Silt Till

Below topsoil, a glacial till deposit was encountered in all boreholes and comprised clayey silt with trace to some sand and gravel, occasional cobbles and some rootlets. Within Boreholes 1, 2, 3, 5, 9, 12 and 14, the clayey silt till extends to the entire borehole depth with interbedded sandy silt about 0.5 m in thickness being encountered within Boreholes 3 and 4, and sandy silt till about 0.9 m in thickness being encountered in Boreholes 14 and 15. The thickness of the clayey silt till encountered in other boreholes ranges between 2 m to 3.5 m.

Measured SPT 'N' values varies from 5 to 47 blows per 0.3 m, typically between 16 and 30 blows per 0.3 m. These results indicate the consistency of the clayey silt till is firm to hard and typically very stiff. Measured natural moisture contents ranges between 12% and 15%.

3.3 Silty Clay Till

Underlying clayey silt till, silty clay till with a trace of sand and gravel was encountered within Boreholes 4, 6, 7, 8, 10 and 11 and extended to the remaining depths of the boreholes with thickness ranging between 0.9 m and 2.1 m.

Measured SPT 'N' values varied from 12 to 41 blows per 0.3 m, indicating a stiff to hard consistency. Measured natural moisture contents ranges between 12% and 18%.

3.4 Sandy Silt Till

Sand silt till was only encountered within Boreholes 14, 15 and 16 at depths about 0.7 m and 4.0 m with thickness of 0.7 m to 1.1 m. Sandy silt till encountered with Borehole 14 and 15 was interbedded with silty clayey deposits.

The measured SPT 'N' values varied from 18 to 32 blows per 0.3 m, indicating a compact to dense relative density.

3.5 Silt

At depth, 1 m thick silt with a trace of clay was only encountered within Borehole 13 at depths from 4 m to the end of the boreholes. The measured SPT 'N' value was 30 indicating a compact relative density.

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3.6 Silty Sand

Silty sand deposit was encountered the silty clay to clayey silt deposit within Borehole 15 at depths between 2.9 m and 5 m. The measured SPT 'N' value was between 19 and 30 indicating a compact relative density.

3.7 Groundwater Conditions

Groundwater levels in the open boreholes were observed during drilling and upon completion of each borehole. Groundwater was noted within Boreholes 3 and 8 and the groundwater level was about 4.5 m below the existing grade upon completion of drilling.

It should, however, be pointed out that these were short-term observations and the ground water condition was probably not stabilized. In addition, the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

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4. DISCUSSION AND RECOMMENDATIONS

It is our understanding that the 98 acre property, owned by Gulietti Brothers Investments and located at 2068 Mayfield Road of Caledon, will be developed for residential housing. We assume that the future proposed development will consist of residential homes with one level of basement and underground services will not be more than 4.0 m in depth.

Based on the sub-surface conditions encountered at the borehole locations, below the topsoil, the site is generally underlain by a very stiff clayey silt till deposit overlying a very stiff silty clay deposits. Cobbles and boulders can be anticipated within the glacial till deposits.

At the time of writing this report, details of the site grading, sewer invert levels and structures locations had not been established. The following discussion and recommendations are, therefore, based on these preliminary information and should be revised or supplemented when details are finalized.

4.1 Site Grading

Although final design grades had not been established at the time of this investigation, it is anticipated that the final grades will generally be set to facilitate access to existing adjacent properties. At this time we do not know the anticipated fill or cut at the site.

Site development will require clearing and stripping the existing topsoil (0.2 to 0.4 m deep).

Since any drainage swale areas will be developed as either roadways or residential lots, it is recommended that all fill be placed as engineered structural fill to facilitate construction. Prior to placement of engineered fill, all the surficial topsoil should be stripped from planned fill areas to expose the inorganic subgrade. The exposed subgrade should be proof rolled with a heavy vibratory sheepsfoot roller to identify any weak area. Any weak or excessively wet zones identified during proof rolling should be sub-excavated and replaced with compacted drier material to establish stable and uniform conditions. Prior to placement of engineered fill, the subgrade should be inspected and approved by the geotechnical engineer. Reference is made to Section 4.3 for recommendations regarding engineered fill placement.

Provided the above recommendations are followed and all topsoil and surficial compressible material is stripped or sub-excavated, the native soil are not considered to be highly compressible and long term settlements are negligible.

4.2 Foundations

Based on the Standard Penetration test results, the very stiff clayey silt till materials are suitable to support spread footing foundations carrying light to medium loads. An allowable soil bearing pressure of 150kPa may be assumed for preliminary design provided that the footings will be

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founded on the undisturbed inorganic very stiff to hard clayey till at a depth of 0.8 m, except at Boreholes 6 and 7 where the footings must be founded at a depth of at least 1.5 m.

The minimum footing sizes, footing thickness, excavations and other footing requirements should be designed in accordance to the latest edition of the Ontario Building Code.

The footing subgrade should be inspected and evaluated by the Geotechnical Engineer prior to concreting to ensure that the footings are founded on competent subgrade capable of supporting the recommended design pressure.

All exterior footings and footings beneath unheated areas should have at least 1.2 m of earth cover or equivalent synthetic insulation for frost protection. Where necessary, the stepping of the footings at different elevations should be carried out at an angle no steeper than 2 horizontal (clear horizontal distance between footings) to 1 vertical (difference in elevation) and no individual footing step should be greater than 0.6 m and may have to be as low as 0.3 m if weaker soils are encountered.

For footings designed and constructed in accordance with the above criteria, total and differential settlements should be less than 25 mm and 20 mm, respectively. These values are usually within tolerable limits for most types of structures.

4.3 Engineered Fill

In low-lying areas, engineered fill may be used to found the structure footings. Engineered fill could be placed after stripping all topsoil, any soils containing excessive organics and otherwise unsuitable soils, within an area extending at least 2.5 m beyond the perimeter of the footprint of the proposed structure. Engineered fill would then be suitable to support the foundations including the slab-on-grade of the structure provided that the following criteria are strictly followed. Engineered fill may also be carried out to raise the existing grades below proposed roads.

The following placement procedure is recommended.

(i) The areal extent of engineered fill should be controlled by proper surveying techniques to ensure that the top of the engineered fill extends a minimum of 2.5 m beyond the perimeter of the building to be supported. Where the depth of engineered fill exceeds 1.5 m this horizontal distance of 2.5 m beyond the perimeter of the building should be increased by at least 1.0 m for each 1.0 m depth of fill.

(ii) The area to receive the engineered fill should be stripped of any topsoil, organic matter, fill and other compressible, weak and deleterious materials. After stripping, the entire area should be inspected and approved by the Geotechnical Engineer. Spongy, wet or soft/loose spots should be sub-excavated to stable subgrade and replaced with

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compactable approved soil, compatible with subgrade conditions, as directed by the Geotechnical Engineer.

(iii) The fill material should be placed in thin layers not exceeding approximately 200 mm when loose. Oversize particles (cobbles and boulders) larger than 120 mm should be discarded, and each fill layer should be uniformly compacted with heavy compactors, suitable for the type of fill used, to at least 98% of its Standard Proctor Maximum Dry Density. Above the foundation level, the original fill can be built up for the slab-on-grade but the quality control may not be as rigid.

The on-site native inorganic soil is generally acceptable for use as engineered fill, provided it is not contaminated with the overlying topsoil and any organic inclusions are removed.

(iv) Full-time geotechnical inspection and quality control (by means of frequent field density and laboratory testing) are necessary for the construction of a certifiable engineered fill and compaction procedure and efficiency should be controlled by the Geotechnical Engineer.

(v) The engineered fill should not be frozen and should be placed at a moisture content within 2% of the optimum value for compaction. The engineered fill should not be performed during winter months when freezing ambient temperatures occur persistently or intermittently.

The allowable soil bearing pressure is 150 kPa for footings supported by at least 0.5 m of engineered fill constructed in accordance with the above recommendations. We also recommend that the footing subgrade should be evaluated by the Geotechnical Engineer prior to placing the formwork.

It is good engineering practice to increase the rigidity of foundations of structures erected over engineered fill, and this is generally achieved by making the footings at least 0.5 m wide, and adding nominal reinforcing (e.g. two 15M bars), to the footings. This measure helps to bridge over eventual weak spots in the fill.

All footings should have at least 1.2 m of earth cover or equivalent artificial insulation for frost protection.

For footings designed and constructed in accordance with the above criteria, total and differential settlements should be less than 25 mm and 20 mm respectively. These values are usually within tolerable limits. The total and differential settlements quoted above also apply to footings founded partly on native soil and partly on engineered fill.

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4.4 Excavation and Dewatering

Since the structures may have one level of basement, the depth of excavation is expected not to exceed 3.0 m. All excavations should be carried out in accordance with the Ontario Health and Safety Regulations. The hard clayey silt till can generally be considered as Type 1 soil. Stiff to very stiff clayey till can be considered as Type 2 soil and firm clayey soil can be considered Type 3 material. We recommend that excavations deeper than 1.2 m should be sloped at 45 degrees. However, near the surface, occasional flatter slopes may be required.

Stockpiles of excavated materials should be kept at least 2.0 m from the edge of the excavation to avoid slope instability. Care should also be taken to avoid overloading of any underground services/structures by stockpiles.

Based on the soils and groundwater conditions at the borehole locations no major dewatering problems are anticipated, although some dewatering may have to be carried out for basement excavations due to minor groundwater seepage from above or from a perched water table in the overlying silty sand materials. Seepage may be experienced from oxidized fissures and/or sand seems. Any seepage can be collected in temporary sumps (protected against erosion where necessary) and removed by pumping. Such sumps should be dug outside the footprint of the building to minimize disturbance to the footing grade.

No major excavation difficulties are foreseen but allowance should be made for boulders and cobbles which occur randomly in glacial deposits.

4.5 Basement Slab-on-Grade Construction

Concrete basement floor slab-on-grade may be built on properly prepared natural subgrade or engineered fill. For fill subgrade, the subgrade should be prepared as specified for engineered fills, and the engineered fill material and its placement should also be in accordance with the Specifications for engineered fills (Section 4.3). Underneath the basement floor slabs, a 150 mm thick base course, consisting of 20 mm size clear stone should be placed to improve the support for the floor slab. This base course should be compacted with vibratory equipment to a uniform high density. If the subgrade is wet, the clear stone base should be separated from the subgrade by an approved filter fabric (e.g. non-woven geotextile, with FOS of 75 - 150 μm, Class II).

4.6 Backfill, Perimeter Drainage and Basement Floor Drainage

The basement walls of the buildings should be backfilled with granular material placed in 125 mm thick loose lifts which can be compacted with light equipment to avoid damaging the basement walls. Heavy compaction equipment should not be operated along basement walls especially when the walls are unsupported at their top. The backfill should not be over-compacted to avoid damage to basement walls. Due to its perviousness, the granular material will permit quick drainage of water to perimeter drains but in order to reduce the quantity of

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water percolating into the backfill, the uppermost 0.5 m of the backfill should consist of clayey soils.

Due to their rigidity and unyielding character, basement walls should be designed for the at-rest earth pressure condition calculated in accordance with the Canadian Foundation Engineering Manual, 3rd Edition. The following parameters may be adopted:

coefficient of lateral earth pressure = 0.45
bulk unit weight of retained soils = 21 kN/m^3

We recommend for basements a permanent drainage system consisting of weeping tile, damp-proofing and an underfloor granular drainage layer as indicated in Section 4.5 will suffice. Weeping tile should be installed along the perimeter of the building to prevent accumulation of water in the backfill and possible moistness of floor slabs. The weeping tile system should be installed to provide a positive discharge to a non-frost susceptible sump or outlet. The weeping tile should be surrounded by a designed graded granular filter or wrapped with an approved geotextile to prevent migration of fines into the system.

The upper 0.6 to 1.0 m of back fill should consist of a relatively impermeable silty clay, which will minimize the ingress of surface water. The site should be graded for drainage away from foundations. A minimum cross fall of three percent immediately adjacent to foundations is recommended to allow for some settlement and promote good surface drainage.

4.7 Sewers

We assume that sewer depths will not exceed 4 m below existing grades. The following discussion is based on this assumption.

4.7.1 Trenching

The boreholes show that the trenches will generally be dug through stiff to hard clayey silt till and silty clay till, compact to dense silt and silty sand materials. Within the clayey till, above the water table, the sides of excavations deeper than 1.2 m can be expected to be temporarily stable at 1V:1H. Within the silt, silty sand and sandy silt till materials, the side slopes should be 1V:1H from the bottom of the trench. Flatter slopes may be required in the weaker surficial layer.

Groundwater seepage within clayey till deposits should be manageable by gravity drainage or filtered sumps. Any seepage can be collected in temporary sumps (protected against erosion where necessary) and removed by pumping. Special care should be taken to potential seepage problems in the areas of Boreholes 13 through 16, where permeable silt and sand materials encountered are permeable. Even though no groundwater was noted upon completion of borehole drilling, potential significant seepage may be anticipated in the event of heavy rain and

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hence, the sand and silt layers should be dewatered prior to trenching. Excavations should be carried out as per the Safety Regulations of the Province of Ontario.

Attention is called to the presence of cobbles and/or boulders which could be encountered during the excavation in the glacial till deposits.

Normal excavation equipment will be suitable for making trenches in which the proposed underground services will be installed. The terms describing the relative density (loose, compact, dense, very dense) or consistency (stiff, very stiff, hard) of soil strata give an indication of the effort needed for excavation.

4.7.2 Bedding

The boreholes show that in their undisturbed state, the very stiff to hard till and compact to dense silt and sand materials will provide adequate support for the sewer pipes and allow the use of normal Class 'B' Type bedding. The recommended minimum thickness of granular bedding below the invert is 150 mm. The thickness of the bedding may, however, have to be increased depending on the pipe diameter or if wet or weak subgrade conditions are encountered. The bedding material should consist of a well graded material such as Granular 'A' or equivalent. After installing the pipe on the bedding, a granular surround of approved bedding material, which extends at least 300 mm above the obvert of the pipe, or as set out by local Authority, should be placed.

All bedding and cover material should be placed in maximum 150 mm loose lifts and should be uniformly compacted to at least 95 Standard Proctor Maximum Dry Density.

4.7.3 Backfill

Based on visual and tactile examination of the soil samples, and the measured moisture contents of the soil samples, the on-site excavated clayey silt till can generally be re-used as backfill in service trenches provided their moisture contents at the time of construction are at or near optimum. The clayey silt till will likely be excavated in cohesive blocks and will be difficult to handle and compact. For use as backfill the material will have to be pulverized and placed in thin layers. The clayey soils will have to be compacted using heavy equipment suitable for these soils which may be difficult to operate in the narrow confines of the trenches. Unless the clayey materials are properly pulverized and compacted in sufficiently thin lifts, post-construction settlements could occur. The backfill should be placed in maximum 200 mm thick layers at or near (± 2%) their optimum moisture content, and each layer should be compacted to at least 95% Standard Proctor Maximum Dry Density. This value should be increased to at least 98% within 0.6 m of the road surface.

The on-site excavated soils should not be used in confined areas (eg. around catchbasins and laterals under roadways) where heavy compaction equipment cannot be operated. The use of

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good backfill together with an appropriate frost taper would be preferable in confined areas. Unsuitable material such as organic soils, boulders, cobbles, frozen soils, etc., should not be used for backfilling.

We recommend that frost taper should be provided at backfilled trenches to ensure gradual transition from the frost-free materials to the frost susceptible natural soil, otherwise differential frost heaving may occur. Frost taper would not be necessary if the backfill material can be matched within the frost zone (i.e. within about 1.2 m depth below the pavement surface) with subgrade-type material.

4.8 Pavement Design

The investigation has shown that the predominant subgrade at the site generally consists of clayey silt till and silty clay till sand to sandy silt till, or may consist of filled subgrade consisting of native soils, which are considered moderately to highly frost susceptible. The following minimum pavement thicknesses should be used as per the Town of Caledon specifications,

PAVEMENT STRUCTURE	COMPACTION	LOCAL RESIDENTIAL
HL-3 Asphaltic Concrete HL-8 Asphaltic Concrete	97% Marshall Density	40 mm 65 mm
Granular 'A' Base	100%	150 mm
Granular 'B' Sub-Base	100%	300 mm

NOTE: **HL-3 and HL-8 asphaltic concrete to conform to Ministry of Transportation's Number SP110F12.**

4.9 Construction Comments

In order to provide a durable pavement structure, the following pavement construction method is recommended.

The subgrade should be adequately prepared to receive the sub-base course. Disturbed and wet subgrade materials should be removed and the top of the subgrade should then be inspected and approved, by proof-rolling, by qualified geotechnical personnel. Cavities created by the removal of unsuitable materials should be backfilled with approved, inorganic fill materials similar to the existing subgrade material. All new fill should be placed in maximum 200 mm loose lifts within ± 2% of its optimum moisture content, and each lift compacted with suitable equipment to minimum 95% Standard Proctor Maximum Dry Density, before placing the next lift.

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The uppermost zones of the roadfill, within 600 mm of the roadbed, should be compacted to minimum 98% Standard Proctor Maximum Dry Density. If construction of the roadfill is carried out in wet weather, the thickness of the sub-base course should be increased. The existing inorganic native material on site can be re-used to raise the grade beneath the proposed pavements, provided it is not contaminated with the overlying topsoil.

Special attention should be paid to proper grading of the subgrade surface: depressions and undulations should be eliminated and, to permit quick drainage, the subgrade surface should be sloped towards ditches, sub-drains and/or catchbasins.

To ensure the longevity of the pavement, the roadbed should be well drained at all times. We recommend that full-length perforated sub-drain pipes of 150 mm diameter be installed along both sides of the road, below the roadbed level, to ensure effective drainage. The sub-drain pipes should be surrounded by 20 mm size clear stone drainage zone of minimum 150 mm thickness, which should have non-woven geotextile (non-woven geotextile, with FOS of 75 - 150 µm, Class II) wraparound to minimize infiltration of fines in pipes which would reduce their effectiveness.

The pavement structure outlined in the previous section could be followed, depending on details of the development. The granular materials should be compacted as per American Society for Testing and Material's Number D698. The placing, spreading and rolling of the asphalt should be in accordance with Ontario Provincial Standard Specifications Form 310, or equivalent.

Construction traffic over exposed subgrade materials should be prohibited, and temporary construction hauling routes established. If these routes coincide with future paved areas, adequately reinforced haul roads (increased thickness of granular base, geo-fabrics, etc.) should be constructed to reduce disturbance to the subgrade soils. These provisions are particularly important if the construction is scheduled during wet and cold seasons.

It is recommended that a programme of geotechnical/material inspection and testing be carried out during the construction phase of the project to confirm that the conditions exposed in the excavations are consistent with those encountered in the boreholes and the design assumptions, and to confirm that the various project specifications and materials requirements are being met.

.../...

5. CLOSURE

We recommend that once the details of the structures are finalized, our recommendations should be reviewed for their specific applicability.

The attached Report Limitations are an integral part of this report.

Sincerely,

AMEC Earth and Environmental Limited

LICENSED PROFESSIONAL ENGINEER
L.Z. LI
PROVINCE OF ONTARIO

Allen L. Li, Ph.D., P. Eng.
Project Manager

Kai-Sing Ho.

Kai-Sing Ho, Ph.D., P. Eng.
Principal Geotechnical Consultant

.../...

AMEC Earth & Environmental Limited

REPORT LIMITATIONS

The conclusions and recommendations given in this report are based on information determined at the testhole locations. The information contained herein in no way reflects on the environmental aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Geotechnical Engineer be retained during the construction to confirm that the subsurface conditions across the site do not deviate materially from those encountered in the testholes.

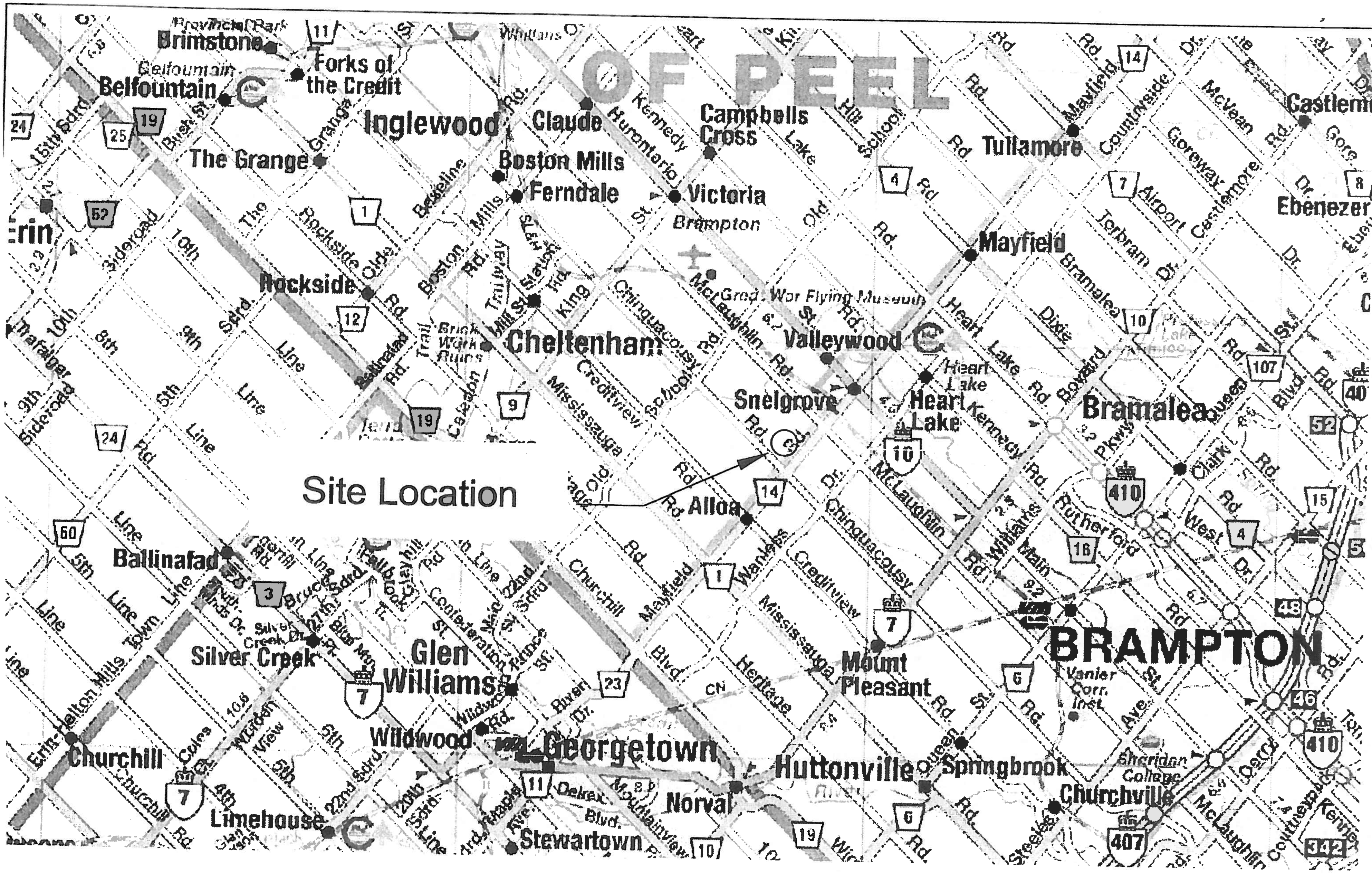
The design recommendations given in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

The comments made in this report relating to potential construction problems and possible methods of construction are intended only for the guidance of the designer. The number of testholes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

The benchmark and elevations mentioned in this report were obtained strictly for use by this office in the geotechnical design of the project. They should not be used by any other party for any other purpose.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. AMEC Earth & Environmental Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report

FIGURES



AMEC EARTH AND ENVIRONMENTAL LIMITED

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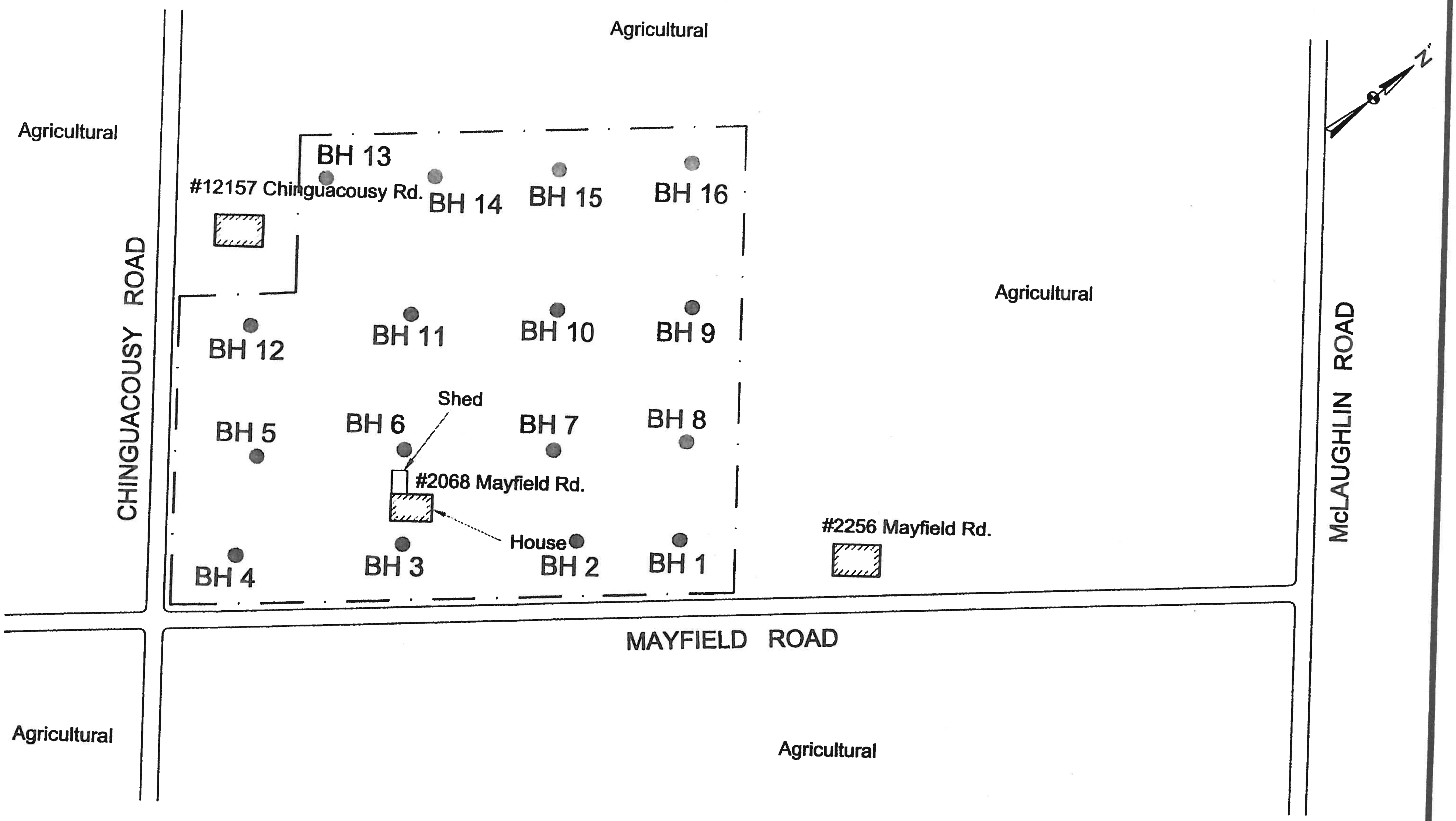
Guglietti Brothers Investments Limited
Preliminary Geotechnical Investigation - New Property in Caledon

Project No.TB02016G

Figure 1 - Site Location Plan

December 2002



LEGEND

Property Boundary — · —

Borehole ●

PRELIMINARY GEOTECHNICAL INVESTIGATION
Guglietti Brothers Investments Limited
2068 Mayfield Road
Brampton, Ontario

Date: December 2002	Approximate Scale: N/S	Project No.: TB02016G
Drawn by: KN	Approved by: PPM	Figure No.: 2 Borehole Location Plan

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RECORD OF BOREHOLES

NOTES TO BOREHOLE LOGS

DRILLING DATA

Method:

SolSt Augering	-	Solid Stem Augering
HolSt Augering	-	Hollow Stem Augering
WB	-	Washed Boring

SAMPLES

TYPE:

SS	-	Split Spoon
AS	-	Auger Sample
TW	-	Thinwall Open
TP	-	Thinwall Piston
WS	-	Washed Sample
BS	-	Block Sample
RC	-	Rock Core
PH	-	Sample Advanced Hydraulically
PM	-	Sample Advanced Manually

LABORATORY DATA

WP	-	Plastic Limit (%)
W	-	Water Content (%)
WL	-	Liquid Limit (%)
γ	-	Natural Unit Weight (kN/m^3)
UNDR STRNG or C_u	-	Undrained Shear Strength (kPa) Field Vane: St-sensitivity
pp	-	Pocket Penetrometer
UC	-	Unconfined Compression
UU	-	Unconsolidated Undrained at Overburden Pressure
CU	-	Consolidated Undrained
CD	-	Consolidated Drained
TOV	-	Total Organic Vapours

Standard The Standard Penetration Test (SPT) 'N'-values are the number of blows required to cause a standard 51 millimetre o.d. split Penetration barrel sample to penetrate 0.3 metres into undisturbed ground in a borehole when driven by a hammer with a mass of 63.5 Test, 'N'-values kilograms falling freely a distance of a 0.76 metres. For penetrations of less than 0.3 metres, N-values are indicated as the number of blows for the penetration achieved (e.g. 50/25: 50 blows for 25 centimetre penetration).

Dynamic Cone Continuous penetration of a conical steel point (51 millimetre o.d. 60° cone angle) driven by 475 J impact energy on a size Penetration Test: drill rods. The resistance to cone penetration is measured as the number of blows for each 0.3 metres advance of the conical into the undisturbed ground.

Soils are described by their composition and consistency or compactness.

CONSISTENCY: Cohesive soils are described on the basis of their undrained shear strength (C_u) or 'N'-values as follows:

C_u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	>200
	VERY SOFT	*SOFT*	*FIRM*	*STIFF*	*VERY STIFF*	*HARD*
N (blows/0.3 metres)	0 - 2	2 - 4	4 - 8	8 - 15	15 - 30	>30

COMPACTNESS: Cohesionless soils are described on the basis of compactness as indicated by 'N'–values as follows:

N (blows/0.3 metres)	0 - 4	4 - 10	10 - 30	30 - 50	>50
	VERY LOOSE	*LOOSE*	*COMPACT*	*DENSE*	*VERY DENSE*

Rocks are described by their composition and structural features and/or strength.

RECOVERY: Sum of all recovered rock core pieces from a coring run expressed as a percent of the total length of the coring run.

ROCK QUALITY DESIGNATION (RQD): Sum of those intact core pieces, 100 millimetres in length expressed as a percent of the length of the coring run. Classification of a rock based on the RQD value as follows:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	*POOR*	*FAIR*	*GOOD*	*EXCELLENT*

JOINTING AND BEDDING:

SPACING	50 millimetres	50 - 300 millimetres	0.3 - 1.0 millimetres	1.0 - 3.0 millimetres	>3.0 millimetres
JOINTING	*VERY CLOSE*	*CLOSE*	*MOD. CLOSE*	*WIDE*	*VERY WIDE*
BEDDING	*VERY THIN*	*THIN*	*MEDIUM*	*THICK*	*VERY THICK*

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RECORD OF BOREHOLE No 1

1 OF 1

CLIENT Guglietti Brothers Investments

LOCATION 2068 Mayfield Road, Caledon, Ontario

ORIGINATED BY IH

REF. TB02016G

BOREHOLE TYPE Solid Stem Augering

COMPILED BY IH

DATUM N/A

DATE 5 December 2002

CHECKED BY AL

SOIL PROFILE			SAMPLES										
ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● 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	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
0.0 -0.2	**0.15m TOPSOIL**												
0.2	brown **CLAYEY SILT TILL** trace to some gravel and sand firm to hard damp		1	SS	8								
			2	SS	28		1						
			3	SS	28		2						
			4	SS	31		3						
	brown -------------- grey		5	SS	23								
							4						
			6	SS	18								
-5.0 5.0	**End of Borehole** Groundwater in Open Bore On Completion: None						5						

+3 ×3 Numbers refer to Sensitivity

RECORD OF BOREHOLE No 2

1 OF 1

CLIENT Guglietti Brothers Investments
LOCATION 2068 Mayfield Road, Caledon, Ontario
ORIGINATED BY IH
REF. TB02016G
BOREHOLE TYPE Solid Stem Augering
COMPILED BY IH
DATUM N/A
DATE 5 December 2002
CHECKED BY AL

SOIL PROFILE			SAMPLES									
ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● 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	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0 -0.2	**0.2m TOPSOIL**											
0.2	brown **CLAYEY SILT TILL** trace to some gravel and sand firm to hard damp		1	SS	7							
			2	SS	28		1					
			3	SS	32		2					
			4	SS	25							
			5	SS	21		3					
	brown ------------- grey						4					
-5.0			6	SS	20							
5.0	**End of Borehole** Groundwater in Open Bore On Completion: None						5					

$+^3$ $\times^3$ Numbers refer to

RECORD OF BOREHOLE No 3

1 OF 1

CLIENT Guglietti Brothers Investments
LOCATION 2068 Mayfield Road, Caledon, Ontario
ORIGINATED BY IH
REF. TB02016G
BOREHOLE TYPE Solid Stem Augering
COMPILED BY IH
DATUM N/A
DATE 5 December 2002
CHECKED BY AL

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100
SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● 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
UNIT WEIGHT γ kN/m³
REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

SOIL PROFILE		SAMPLES					
ELEV DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE
0.0	**0.2m TOPSOIL**						
-0.2 0.2	brown **CLAYEY SILT TILL** trace to some gravel and sand stiff becoming very stiff damp	1	SS	9			
		2	SS	25		1	
	------------------- some sand lenses						
		3	SS	23			
-2.1 2.1	brown **SANDY SILT** compact wet					2	
		4	SS	28			
-2.6 2.6	**CLAYEY SILT TILL** some sand and gravel very stiff damp						
	brown ---------- grey	5	SS	16		3	
						4	
					▽		
		6	SS	16			
-5.0 5.0	**End of Borehole** Groundwater in Open Bore On Completion: 4.6m					5	

$+^3$ $\times^3$ Numbers refer to Sensitivity

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RECORD OF BOREHOLE No 4

1 OF 1

CLIENT Guglietti Brothers Investments
LOCATION 2068 Mayfield Road, Caledon, Ontario
ORIGINATED BY IH
REF. TB02016G
BOREHOLE TYPE Solid Stem Augering
COMPILED BY IH
DATUM N/A
DATE 5 December 2002
CHECKED BY AL

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

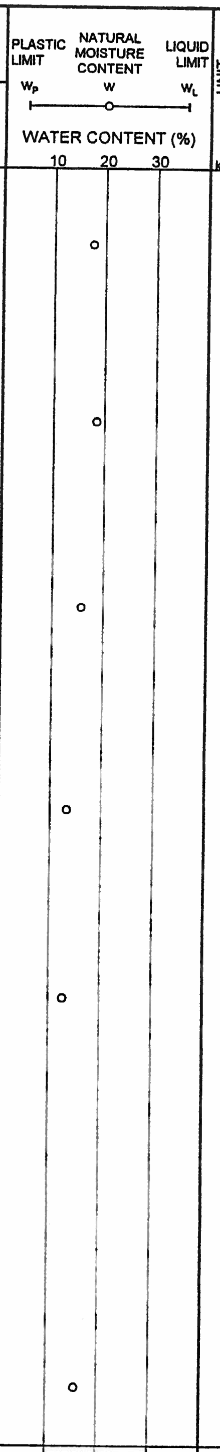
SHEAR STRENGTH kPa
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

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

UNIT WEIGHT γ kN/m³

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

SOIL PROFILE ELEV DEPTH (m)	DESCRIPTION	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH m
0.0	**0.2m TOPSOIL**					
-0.2 0.2	brown **SANDY SILT** trace to some gravel loose damp	1	SS	9		
-0.6 0.6	brown **CLAYEY SILT TILL** trace to some gravel and sand very stiff to hard damp	2	SS	24		1
		3	SS	25		2
		4	SS	33		3
		5	SS	41		4
-4.1 4.1	grey **SILTY CLAY TILL** trace gravel very stiff damp	6	SS	16		
-5.0 5.0	**End of Borehole** Groundwater in Open Bore On Completion: None					5



+3 ×3 Numbers refer to

amec

RECORD OF BOREHOLE No 5

1 OF 1

CLIENT Guglietti Brothers Investments
LOCATION 2068 Mayfield Road, Caledon, Ontario
ORIGINATED BY IH
REF. TB02016G
BOREHOLE TYPE Solid Stem Augering
COMPILED BY IH
DATUM N/A
DATE 5 December 2002
CHECKED BY AL

SOIL PROFILE			SAMPLES									
ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa O UNCONFINED + FIELD VANE ● 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	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**0.3m TOPSOIL**											
-0.3 0.3	brown **CLAYEY SILT TILL** trace to some gravel and sand firm to hard damp		1	SS	7							
			2	SS	26		1					
			3	SS	30							
							2					
			4	SS	24							
							3					
	brown ---------------- grey, some sand lenses		5	SS	34							
							4					
			6	SS	17							
-5.0 5.0	**End of Borehole** Groundwater in Open Bore On Completion: None						5					

+³ x³ Numbers refer to Sensitivity

amec

RECORD OF BOREHOLE No 6

1 OF 1

CLIENT Guglietti Brothers Investments
LOCATION 2068 Mayfield Road, Caledon, Ontario
ORIGINATED BY IH
REF. TB02016G
BOREHOLE TYPE Solid Stem Augering
COMPILED BY IH
DATUM N/A
DATE 5 December 2002
CHECKED BY AL

SOIL PROFILE		SAMPLES					
ELEV DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE
0.0 -0.2	**0.2m TOPSOIL**						
0.2	grey **CLAYEY SILT TILL** trace to some gravel and sand trace rootlets stiff to hard damp	1	SS	9			
		2	SS	12		1	
		3	SS	39		2	
		4	SS	32			
-2.9 2.9	grey **SILTY CLAY TILL** trace gravel and sand stiff to very stiff damp	5	SS	18		3	
						4	
		6	SS	12			
-5.0 5.0	**End of Borehole** Groundwater in Open Bore On Completion: None					5	

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH kPa
○ UNCONFINED + FIELD VANE
● 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

UNIT WEIGHT γ kN/m³

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

$+^3$ $\times^3$ Numbers refer to

amec

RECORD OF BOREHOLE No 7

1 OF 1

CLIENT Guglietti Brothers Investments
REF. TB02016G
DATUM N/A
LOCATION 2068 Mayfield Road, Caledon, Ontario
BOREHOLE TYPE Solid Stem Augering
DATE 5 December 2002
ORIGINATED BY IH
COMPILED BY IH
CHECKED BY AL

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100
SHEAR STRENGTH kPa
○ UNCONFINED + FIELD VANE
● 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

UNIT WEIGHT γ kN/m³

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

ELEV DEPTH (m)	SOIL PROFILE DESCRIPTION	SAMPLES NUMBER	TYPE	"N" VALUES	DEPTH m
0.0	**0.25m TOPSOIL**				
-0.2 0.2	brown **CLAYEY SILT TILL** trace to some sand and gravel, some rootlets firm becoming very stiff damp	1	SS	5	
		2	SS	11	1
		3	SS	26	2
		4	SS	26	
-2.9 2.9	grey **SILTY CLAY TILL** trace to some gravel stiff damp	5	SS	13	3
					4
	------------------ some sand lenses	6	SS	14	
-5.0 5.0	**End of Borehole** Groundwater in Open Bore On Completion: None				5

+3 ×3 Numbers refer to

amec

RECORD OF BOREHOLE No 8

1 OF 1

CLIENT Guglietti Brothers Investments
LOCATION 2068 Mayfield Road, Caledon, Ontario
ORIGINATED BY IH
REF. TB02016G
BOREHOLE TYPE Solid Stem Augering
COMPILED BY IH
DATUM N/A
DATE 5 December 2002
CHECKED BY AL

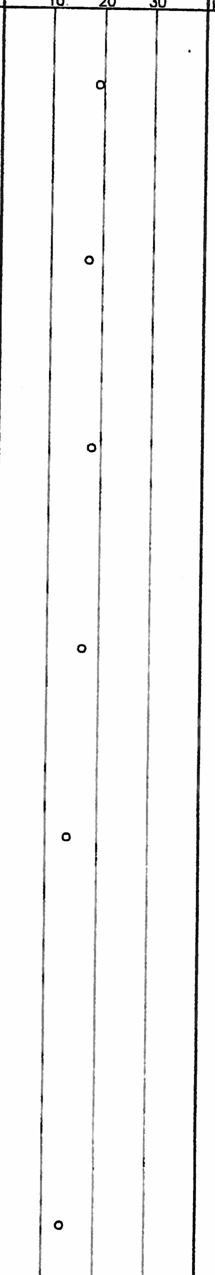
DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100
SHEAR STRENGTH kPa
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

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

UNIT WEIGHT γ kN/m³

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

ELEV DEPTH (m)	SOIL PROFILE DESCRIPTION	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH m
0.0 -0.2	**0.2m TOPSOIL**					
0.2	brown **CLAYEY SILT TILL** trace to some sand and gravel firm to hard damp	1	SS	7		
		2	SS	16		1
		3	SS	18		2
		4	SS	33		
-2.9 2.9	grey **SILTY CLAY TILL** trace gravel very stiff damp					3
		5	SS	20		
						4
					⊻	
		6	SS	18		
-5.0 5.0	**End of Borehole** Groundwater in Open Bore On Completion: 4.4m					5



$+^3$ $\times^3$ Numbers refer to Sensitivity

RECORD OF BOREHOLE No 9

1 OF 1

CLIENT Guglietti Brothers Investments
LOCATION 2068 Mayfield Road, Caledon, Ontario
ORIGINATED BY IH
REF. TB02016G
BOREHOLE TYPE Solid Stem Augering
COMPILED BY IH
DATUM N/A
DATE 5 December 2002
CHECKED BY AL

SOIL PROFILE			SAMPLES									
ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● 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	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0 -0.2	**0.2m TOPSOIL**											
0.2	brown **CLAYEY SILT TILL** trace to some sand and gravel, some rootlets firm to hard damp ------------------ some rootlets		1	SS	5							
			2	SS	26		1					
			3	SS	29		2					
			4	SS	38		3					
			5	SS	30							
	brown ----------------- grey						4					
-5.0			6	SS	20		5					
5.0	**End of Borehole** Groundwater in Open Bore On Completion: None											

$+^3$ $\times^3$ Numbers refer to Sensitivity

RECORD OF BOREHOLE No 10

1 OF 1

CLIENT Guglietti Brothers Investments
REF. TB02016G
DATUM N/A
LOCATION 2068 Mayfield Road, Caledon, Ontario
BOREHOLE TYPE Solid Stem Augering
DATE 5 December 2002
ORIGINATED BY IH
COMPILED BY IH
CHECKED BY AL

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH kPa
○ UNCONFINED + FIELD VANE
● 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

SOIL PROFILE			SAMPLES										
ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**0.25m TOPSOIL**											
-0.2 0.2	brown **CLAYEY SILT TILL** trace to some sand and gravel, some rootlets damp		1	SS	5							
			2	SS	34		1					
			3	SS	37							
							2					
			4	SS	34							
							3					
			5	SS	47							
-4.0 4.0	grey **SILTY CLAY TILL** trace gravel very stiff moist						4					
			6	SS	16							
-5.0 5.0	**End of Borehole** Groundwater in Open Bore On Completion: None						5					

$+^3$ $\times^3$ Numbers refer to Sensitivity

amec

RECORD OF BOREHOLE No 11

1 OF 1

CLIENT Guglietti Brothers Investments
LOCATION 2068 Mayfield Road, Caledon, Ontario
ORIGINATED BY PPM
REF. TB02016G
BOREHOLE TYPE Solid Stem Augering
COMPILED BY IH
DATUM N/A
DATE 6 December 2002
CHECKED BY AL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa O UNCONFINED + FIELD VANE ● 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	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES							
0.0 -0.2	**0.2m TOPSOIL**											
0.2	brown **CLAYEY SILT TILL** trace sand and gravel, some rootlets very stiff to hard damp		1	SS	16							
			2	SS	29		1					
			3	SS	34		2					
			4	SS	27							
			5	SS	24		3					
-4.0 4.0	grey **SILTY CLAY TILL** trace Gravel very stiff moist						4					
			6	SS	16							
-5.0 5.0	**End of Borehole** Groundwater in Open Bore On Completion: None						5					

+3 x3 Numbers refer to