



PRELIMINARY FOUNDATION ASSESSMENT REPORT

for

**HIGHWAY 6 (HANLON EXPRESSWAY) IMPROVEMENTS
SPEED RIVER TO WELLINGTON ROAD 34
G.W.P. 3002-05-00
CITY OF GUELPH, WELLINGTON COUNTY
DISTRICT 31, LONDON, ONTARIO**

PETO MacCALLUM LTD.
165 CARTWRIGHT AVENUE
TORONTO, ONTARIO
M6A 1V5
Phone: (416) 785-5110
Fax: (416) 785-5120
Email: Toronto@petomaccallum.com

Distribution:

4 cc: Stantec Consulting Ltd. for distribution to MTO
+ 2 digital copies
1 cc: Stantec Consulting Ltd. + 1 digital copy
1 cc: PML Toronto

PML Ref.: 07TF001
Index No.: 019FAR
Geocres No.: 40P9-42
May 11, 2009



TABLE OF CONTENTS

1. INTRODUCTION	1
2. LITERATURE REVIEW	1
3. SITE RECONNAISSANCE AND DESCRIPTION	2
3.1 College Avenue Overpass Site	2
3.2 Stone Road Interchange Site	2
3.3 Kortright Road/Downey Road Overpass Site	3
3.4 Laird Drive Interchange Site	3
4. PHYSIOGRAPHIC AND GEOLOGIC SETTINGS	3
5. SUMMARIZED SUBSURFACE CONDITIONS	4
5.1 General	4
5.2 College Avenue (Realigned)	5
5.2.1 Sand and Gravel	5
5.2.2 Fine Sand to Clayey Silt	5
5.2.3 Clayey Silt with Sand (Glacial Till)	6
5.2.4 Limestone Bedrock	6
5.2.5 Groundwater	6
5.3 Stone Road	6
5.3.1 Topsoil	7
5.3.2 Sand/Silty Sand/Silt	7
5.3.3 Silt Till/Sand and Gravel	7
5.3.4 Bedrock	7
5.3.5 Groundwater	7
5.4 Kortright Road/Downey Road	8
5.4.1 Topsoil	8
5.4.2 Silty Sand/Silt/Sand and Gravel	8
5.4.3 Silty Sand Till/Sandy Silt Till/Clayey Silt Till	9
5.4.4 Bedrock	9
5.4.5 Groundwater	9
5.5 Laird Road	9
5.5.1 Topsoil	10
5.5.2 Sandy Silt Till	10
5.5.3 Bedrock	10
5.5.4 Groundwater	10
6. MISCELLANEOUS	10



7. DISCUSSION AND RECOMMENDATIONS	11
7.1 General.....	11
7.2 College Avenue NB and SB Overpasses	12
7.2.1 General Comments	12
7.2.2 Overview Assessment.....	12
7.3 Stone Road Interchange Underpass	13
7.3.1 General Comments	13
7.3.2 Overview Assessment.....	14
7.4 Kortright Road/Downey Road NB and SB Overpasses.....	15
7.4.1 General Comments	15
7.4.2 Overview Assessment.....	16
7.5 Laird Road Interchange Underpass.....	16
7.5.1 General Comments	16
7.5.2 Overview Assessment.....	17
7.6 Approach Embankments and Earth Cuts	18
7.7 Excavation Considerations and Drainage.....	19
8. ADDITIONAL STUDIES.....	20
9. CLOSURE	22

Table 1 – Preliminary Reference Foundation Conditions

Drawing A – Key Plan

Drawing 1 – College Avenue Overpass Plan

Drawing 2 – Stone Road Underpass Plan

Drawing 3 – Kortright Road Overpass Plan

Drawing 4 – Laird Road Underpass Plan

Explanation of Terms Used in Report

Appendix A – List of Reference Documents

Appendix A1 – Water Well Records

Appendix B – Site Photographs

Appendix C – Reference Subsurface Data

PRELIMINARY FOUNDATION ASSESSMENT REPORT

for

Highway 6 (Hanlon Expressway) Improvements
Speed River to Wellington Road 34
G.W.P. 3002-05-00
City of Guelph, Wellington County
District 31, London, Ontario

1. INTRODUCTION

This report presents the results of the preliminary foundation assessment carried out for the future improvements to Highway 6 from the Speed River in the City of Guelph to north of Wellington Road 34 in the Township of Puslinch, Wellington County. Highway 6 is also referred to as the Hanlon Expressway within the City of Guelph. Peto MacCallum Ltd. (PML) carried out the study for Stantec Consulting Ltd. (Stantec) on behalf of the Ministry of Transportation of Ontario (MTO).

The Hanlon Expressway is a four-lane divided highway with six at-grade intersections within the overall study area. The foundation assessment of this study is to evaluate the sites of four proposed grade separations. According to the Preferred Alternative (updated January 30, 2009), underpasses are proposed at Stone Road and Laird Road to upgrade the existing intersections to interchanges and overpasses are planned at College Avenue and Kortright Road/Downey Road. A partial interchange is planned at Kortright Road/Downey Road. Presently, it is planned to close the access to the Hanlon Expressway at Clair Road and Maltby Road.

The recommended foundation alternatives for the proposed structures at the four sites are also discussed in this report. This study is based on a literature review and site reconnaissance at the proposed structure sites. The MTO Terms of Reference do not require a subsurface field exploration for this study.

2. LITERATURE REVIEW

The literature review for this preliminary investigation along the Hanlon Expressway corridor comprised of searching various reference data banks including:

- MTO GEOCRES Library
- Peto MacCallum Ltd. Completed Geotechnical Reports
- City of Guelph Library of Completed Reports
- Geological Reports and Maps
- MOE Water Well Records



The compiled data bank information was used to develop foundation background data of the probable/inferred soils profile, bedrock lithology and groundwater regime near and at each site under consideration. A list of the various reports and documents reviewed to obtain the foundation information is included in Appendix A. A copy of the MOE water wells is provided in Appendix A-1. All elevations in this report are expressed in metres.

The previous subsurface investigations were carried out up to 39 years ago and site conditions may have since been altered. In particular, surficial subsoil and the upper zones of the previously encountered soils may have been removed or covered with fill as part of site grading from previous and/or ongoing development. This limitation should be considered when referring to the compiled data in this report.

3. SITE RECONNAISSANCE AND DESCRIPTION

A site reconnaissance was carried out on November 15, 2007 to document the terrain and general conditions at the four structure sites. Selected photographs obtained during the site visit are enclosed in Appendix B.

3.1 College Avenue Overpass Site

The College Avenue overpass site is located about 65 m north of the existing intersection of College Avenue and the Hanlon Expressway. The land use to the south of College Avenue is primarily residential. Centennial School (Photograph A-1) and College Heights Secondary School (visible beyond the highway in Photograph A-3) occupy part of the northeast quadrant. The northwest quadrant is undeveloped (Photograph A-4) and was historically a quarry site (Gypsum Company). The immediate area surrounding the site is a gently rolling terrain. To the west, the ground rises indicating the possible presence of a drumlin (Photographs A-2 and A-4).

3.2 Stone Road Interchange Site

The Preferred Alternative calls for the construction of the Stone Road interchange underpass about 40 m to the south of the existing intersection with the Hanlon Expressway (Photograph B-2). Mixed land use was noted at this site. Residences and multi-storey buildings occupy the general vicinity of the site. The northwest quadrant is also the site of a school (Mary Phelan Catholic School). A hotel (Holiday Inn) occupies a site on the northeast quadrant. The southeast quadrant has a mainly commercial/industrial occupancy. East of the Hanlon Expressway, the terrain has a gently rolling character (Photographs B-1 and B-2). The topography west of the Hanlon Expressway comprises of rolling terrain (Photographs B-3 and B-4), with the ground sloping up to the west along Stone Road (from where Photograph B-5 was taken) and sloping



down to the south from Stone Road to a low-lying gravel terrace (Photographs B-4 and B-5). The gravelly soil exposure in the south ditch of Stone Road indicates a probable drumlin (Photograph B-6).

3.3 Kortright Road/Downey Road Overpass Site

Kortright Road extends easterly and Downey Road westerly from their common intersection with the Hanlon Expressway, where the Preferred Plan calls for two overpasses (Photograph C-1). Except for the recreational use on the northwest quadrant (YMCA site on Photograph C-2) and undeveloped land on the southwest (Photograph C-4), the remaining lands have a residential use near the proposed grade separation location. A rolling terrain generally characterises the local topography (Photographs C-1 and C-3). The Hanlon Creek crosses Downey Road about 300 m west of the current intersection and the Hanlon Expressway about 600 m to the south.

3.4 Laird Drive Interchange Site

The Preferred Plan calls for an interchange underpass at Laird Road constructed at the location of the existing intersection (Photograph D-1). The land use east of Hanlon Expressway is currently industrial and manufacturing known as the Hanlon Industrial Park (Photographs D-2 and D-4). The west is currently undeveloped, with only a few residences (Photograph D-3), however the future Hanlon Creek Business Park will be developed in this location. Further west, there are licensed gravel pits in operation. The topography comprises a relatively flat to gently undulating terrain.

4. PHYSIOGRAPHIC AND GEOLOGIC SETTINGS

Highway 6 lies within the two distinct physiographic regions known as the “Guelph Drumlin Field” (northern section) and the “Horseshoe Moraines”. The drumlins contain till soils which are loamy and calcareous and mainly derive from the Lockport Dolomites. These till soils are rather stony and contain variable boulder content. There are numerous interconnecting cross-valleys, which occupied deeper depressions between the drumlins. Along the sides of these valleys, there are broad sand and gravel terraces. The outwash plains are filled with gravelly sands with variable stone content and kame ridges in some areas. Eskers and esker/kames are also present in the general area.

The Horseshoe Moraines are characterized by stony knobs and ridges and gravel or swamp floored valleys.



Much of the local geology in the City of Guelph area consists of a till plain of which over half of the area is drumlinized. Complex geologic settings involving the Breslau Moraine and Wentworth Till with intermittent outwash sand and gravel are present along the Highway 6 corridor. The Breslau Moraine is probably the oldest end moraine, predominately a till moraine in the Guelph map-area, whereas, the sandy to silty sand Wentworth Till is the youngest till sheet in the area and is at or near the surface over most of the Guelph area.

The entire study area is underlain by Lockport and Guelph dolomites at depths ranging from 0 to more than 40 m increasing from the north end (Speed River) to the south end of the project limits. The Lockport dolomite formation is exposed in the Speed River valley (elevation ± 304.5) at the north end of the project and is relatively flat lying (elevations ± 309.5 to 311.0) in previous boreholes drilled at the future College Avenue overpass.

The thickness of the soil cover is typically 10 to 15 m in the vicinity of College Avenue and Kortright Road/Downey Road, up to 45 m in the localized buried bedrock valley at Stone Road, and increases sharply to the south towards Laird Road and Clair Road to thicknesses greater than 40 m.

5. SUMMARIZED SUBSURFACE CONDITIONS

5.1 General

The subsurface information contained in this report is based on previous PML reports and MTO GEOCRES files in the Guelph area. Selected reports from the City of Guelph library of completed projects were also used. We refer to the relevant Record of Borehole sheets compiled in Appendix C for details of the previous field work including soil descriptions, inferred stratigraphy, standard penetration N values, groundwater observations carried out during and upon completion of drilling, and laboratory test results. The locations of the relevant data used for reference in this report are approximately shown on Drawings A (Key Plan) and 1 to 4.

The following Sections provide summarized descriptions of the inferred subsurface conditions at each of the four proposed structure sites, which MTO and Stantec selected as the preferred options for the Highway 6 (Hanlon Expressway) Improvements. The existing pavement and embankment fill was not encountered in the previous reference boreholes and was not described in the report.



All dimensions in this report are in the Metric System of Units and the elevations are expressed in metres. The units were converted from the Imperial Units in some of the previous reports.

5.2 College Avenue (Realigned)

Refer to the appended Record of Boreholes 1 to 8 and Drawing No. 987502-A in Appendix C showing the borehole locations and soil strata from the Foundation Investigation Report for the College Avenue Overpass, W.P. No. 98-75-02 (MTO GEOCRETS No.: 40P9-20), Site 35-420. The previous alignment was planned 1.1 km south of the Speed River on Hanlon Expressway which is near the presently planned location. The report is dated January 16, 1976. The overpass and previous borehole locations are shown on Drawing 1.

The subsoil consists of 7.0 to 9.1 m of bedded sands and gravels laid down when the valley formed a large glacial spillway. Beneath this layer there is 1.5 to 3.0 m of fine grained material ranging from fine sand to clayey silt. This layer is in turn underlain by a glacial deposit of 4.6 to 6.1 m of clayey silt with sand and a trace of gravel. Beneath these layers, some 15.0 to 16.5 m below the surface, is limestone bedrock.

The ground surface at the proposed structure location is at about elevation 327.

5.2.1 Sand and Gravel

The 7.0 to 9.1 m thick layer of sand and gravel was laid down in beds to levels ranging from elevations 316.2 to 319.8 by a much larger river which occupied the valley of the Speed River in the immediate post glacial period. The deposit is well graded with standard penetration N values ranging from 20 to in excess of 50, indicating a relative density ranging from compact to very dense. The moisture content is very low being less than 5%.

5.2.2 Fine Sand to Clayey Silt

This layer which varies from 1.5 to 3.0 m in thickness consists of fine grained material and extends to 9.1 to 14.2 m depths, elevations 313.0 to 317.7. The western portion of the deposit shows a low degree of cohesiveness and a very stiff consistency. The eastern portion is generally non-cohesive consisting of up to 70% fine sand with most of the remainder being silt. The relative density of this portion of the deposit ranges from compact to dense with standard penetration N values ranging from 20 to 54.



5.2.3 Clayey Silt with Sand (Glacial Till)

This deposit, which is 4.6 to 6.1 m in thickness, exhibits a low degree of plasticity and extends to 15.2 to 16.5 m depths, elevations 309.2 to 311.4. Two of the boreholes (4 and 6) terminated within or above this layer. It contains large quantities of sand ranging up to 50% as well as a trace of gravel. Consistency is generally very hard with standard penetration N values being in excess of 100. The exception to this is in a shallow upper zone of the deposit which has been softened by groundwater. Moisture content for the lower portion of the deposit is generally less than 10%.

5.2.4 Limestone Bedrock

Limestone bedrock was encountered at a depth ranging from approximately 15.2 to 16.5 m, elevations 309.2 to 311.4. It has a relatively flat surface with only a shallow weathered zone at the surface. The rock surface is relatively level from the west to the centreline median (elevations 310.6 to 311.4) and drops to another level surface about 2 m to the east (elevations 309.2 and 309.3).

5.2.5 Groundwater

Groundwater was encountered at approximate depths of 11.5 to 13.0 m, elevation 313.9.

5.3 Stone Road

The field investigations near the existing intersection of Stone Road with the Hanlon Expressway were carried out in September and October 1975 for the Holiday Inn Hotel (PML Ref. No.: 75F151) and in May 1981 for the Wood Glen Subdivision (PML Ref. No.: 81F98).

The summarized subsurface conditions presented below are based on 13 boreholes selected from the reports. Seven of the boreholes (PML Ref. No.: 75F151 – Boreholes A, B, C, D, 1, 4 and 5) are located north of Stone Road between Scottsdale Drive and Hanlon Expressway, at the existing Holiday Inn area and the other six boreholes (PML Ref. No.: 81F98 – Boreholes 1 to 6) are located south of Stone Road and west of Hanlon Expressway. Refer to Drawing 2 and Appendix C for the project and borehole locations.

The subsurface stratigraphy varies across the Stone Road site. The major soil units encountered in the vicinity of the proposed structure are cohesionless sand/silty sand and silt overlying a silt till which varies in composition from sandy silt to clayey silt, some gravel. The till is interbedded with sand layers. Bedrock was not encountered in the boreholes to a maximum exploration depth of 11.6 m.



The ground surface at the existing intersection is at about elevation 334.

5.3.1 Topsoil

Generally, a surficial layer of topsoil was encountered, extending to 0.2 to 0.4 m depths below ground surface. The dark brown to black topsoil is comprised of loose sandy silt to silt with roots.

5.3.2 Sand/Silty Sand/Silt

This cohesionless layer, which comprises variable soils from sand to silty sand to silty, extended to depths varying from over 1.5 to over 6.6 m, elevations 314.0 to 318.4 in the general site area. The relative density of these units ranged widely from loose to very dense with N values ranging from 6 to 56 and with typical values in the compact range from 12 to 27. Natural moisture content determinations ranged widely from 2 to 24%.

5.3.3 Silt Till/Sand and Gravel

Cohesionless silt till deposits locally grading to sand and gravel units were encountered typically below the sand/silty sand/silt units and extended to the 5.0 to 11.6 m termination depths of the boreholes. The relative density of the silt till and sand and gravel layers ranged from compact to very dense. N values ranged from 13 to 103. Natural moisture content determinations ranged widely from 4 to 28%.

5.3.4 Bedrock

Bedrock was not encountered in any of the two previous investigations.

Drift thickness of more than 15 to 18 m overlies the dolomite limestone bedrock surface in the general vicinity of the interchange site. At the structure site, however the bedrock is inferred to be 44 to 52 m deep forming a localized buried valley running perpendicularly to the highway with bottom levels ranging from elevations 282 to 290.

5.3.5 Groundwater

Groundwater was encountered locally at approximate depths of 0.9 to 4.9 m, about elevation 317 west of the underpass site.



5.4 Kortright Road/Downey Road

The field investigations in the vicinity of the existing intersection of Kortright Road/Downey Road and the Hanlon Expressway were carried out by PML (previous PML Ref. No(s): 88F666 dated December 1988, 76F220, dated October 1976 and 76F148, dated July 1976) and by Hydrology Consultants Limited, Report No: 8295 (City of Guelph No.: 539), dated July 1973.

To summarize the subsurface conditions in the area of the intersection, 12 boreholes and 12 test pits were selected from the above mentioned reports. Four boreholes (PML Ref. No.: 76F148 – Boreholes 1 to 3 and Hydrology Consultants Limited Report No.: 8295 – TH2/73) are located on the northeast quadrant of the existing intersection, four boreholes at northwest quadrant (PML Ref. No. 88F666), 12 test pits are located at the southwest quadrant (PML Ref. No.: 76F220 – Test Pits 1, 3, 4, 5, 8, 10, 22, 27, 28, 40, 54 and 151) and four boreholes are located at the southeast quadrant (Hydrology Consultants Limited, Report No: 8295 – BH1/73 to BH3/73 and TH3/73). Refer to Drawing 3 for the locations of the completed studies and to Appendix C for the borehole records and locations.

The local stratigraphy comprised discontinuous units of sand and gravel, sand and silt below a topsoil unit overlying sandy silt till/sandy silt till deposits. Bedrock was not contacted in the boreholes.

The ground surface at the existing intersection is at about elevation 323.

5.4.1 Topsoil

A surficial layer of dark brown to black sandy silt to silty topsoil was encountered at the time of the investigations extending to 0.1 to 1.2 m depths below ground surface, elevations 315.1 to 331.3.

5.4.2 Silty Sand/Silt/Sand and Gravel

These cohesionless layers, which are 0.3 to 5.5 m in total thickness (typically 1.0 to 2.0 m thick), were encountered in the vicinity of the site and locally contained cobbles and boulders. The layers extended to a wide range of depths from about 0.3 to 5.5 m, elevations 313.9 to 329.9. The relative density of the silty sand/silt/sand and gravel was typically compact to dense. Local N values ranged from 6 to 45. Water contents ranged from 5 to 12%.



5.4.3 Silty Sand Till/Sandy Silt Till/Clayey Silt Till

These till layers were encountered below the silty sand/silt/sand and gravel or immediately below the topsoil. The layers extended to the termination depths of the boreholes and test pits ranging from 2.4 to 9.1 m. The relative density of the cohesionless layers was typically compact to very dense. N values ranged from 12 to 81. Moisture content determinations ranged from 4 to 15%.

The consistency of the discontinuous clayey silt till layers was very stiff. N values ranged from 16 to 18. Moisture content determinations ranged from 17 to 20%.

5.4.4 Bedrock

Bedrock was not encountered in the previous investigations at this site.

Generally, the drift thickness in the vicinity of the site is 8 to 15 m. It is estimated that the bedrock surface at the structure sites is about 12 to 13 m deep, at elevations 299 to 300.

5.4.5 Groundwater

Groundwater was encountered locally at 0.7 to 5.1 m depths, typically at elevations ranging from 313.5 to 314.1 in the previous boreholes. The inferred (1982/1986) water level in the Hanlon Creek from previous studies was at elevation 313 at the Downey Road culvert and elevation 316 at the Hanlon Road culvert.

5.5 Laird Road

The field investigations in the vicinity of the existing intersection of Laird Road and the Hanlon Expressway were carried out by PML (previous PML Ref. No(s): 89F4 dated January 1989, 86F16 dated January 1986 and 99KF070 dated July 1999).

To summarize the subsurface conditions near the proposed interchange, 12 boreholes and 3 test pits were considered from the above mentioned reports. Six boreholes (PML Ref. No.: 86F16 – Boreholes 1 to 6) are located in the southeast quadrant of the intersection of Laird Road and Southgate Drive, six boreholes (PML Ref. No.: 89F4 – Boreholes 1 to 6) are located in the northeast quadrant, and three test pits (PML Ref. No.: 99KF070 – Test Pit Nos. 1 to 3) are located at 6662 Laird Road, west of the existing intersection. Refer to Drawing 4 for the completed project locations and to Appendix C for the locations and records of boreholes.



The Laird Road site is within an area of importance for gravel pit extraction. The major soil units encountered in the vicinity of the Laird Road are very dense and stony silty sand/sandy silt till grading to sand/sand and gravel. Bedrock was not encountered in the boreholes or test pits.

The ground surface at the existing intersection of Laird Road and Hanlon Expressway is at about elevation 331. The geodetic elevations of the three test pits were not established.

5.5.1 Topsoil

A surficial layer of dark brown topsoil comprising sandy silt to gravelly sandy silt with organics was encountered, extending to 0.2 to 0.5 m depths below ground surface at the time of the previous investigations.

5.5.2 Sandy Silt Till

Deposits of cohesionless stony soils comprising sands, sand and gravel, and sandy silt till units were encountered to 1.5 to 5.1 m depths, elevations 328.7 and 332.8. Cobbles and boulders were encountered in the units. The relative density of soils was very dense based on N values ranging from 54 to 124. The moisture content determinations ranged from 5 to 7%.

Finer sandy soils were locally found west of Laird Road in the three test pits that were extended to about 1.9 to 2.5 m depths.

5.5.3 Bedrock

Bedrock was not encountered in any of the previous investigations.

It is inferred from literature review that the thickness of the soil cover is more than 15 m in the vicinity of the site.

5.5.4 Groundwater

No groundwater was encountered in the previous investigations.

6. MISCELLANEOUS

The subsurface conditions for this Foundation Assessment Report were based on a literature review, including previous subsurface data and a site reconnaissance and did not include subsurface investigations or laboratory testing.



7. DISCUSSION AND RECOMMENDATIONS

7.1 General

For the purpose of this report, we assumed that the height of the approach embankments at the interchange underpasses for the Stone Road and Laird Road sites are in the order of 8 to 11 m. Similarly, it was assumed that the existing ground surface grades along the realigned College Avenue and Kortright Road/Downey Road will be lowered by about 6 to 7 m under the Hanlon Expressway.

Design and construction of foundations to support the proposed structures in accordance with the Canadian Highway Bridge Design Code (CHBDC), 2006 Edition, and standard MTO procedures is feasible. A minimum of 1.2 m of earth cover is required over the footings or pile caps for adequate frost protection.

It is considered feasible to found the College Avenue and Stone Road structures on shallow (spread footings) or deep (driven H-piles or caissons) foundations. Spread footings and steel H-piles are also feasible at the Kortright Road/Downey Road and Laird Road sites, however the inferred boulder content in the native soils is excessive for practical caisson installations. The piles will require driving shoes due to the boulders present in the native soils.

For planning purposes, the inferred founding conditions and preliminary foundation schemes including reference founding data, inferred founding conditions and preliminary geotechnical resistances (ULS and SLS) using spread footings on native soil or steel H-piles are provided in the following paragraphs and summarized in the attached Table 1.

Comments on the feasibility of design and construction and overview assessments of the alternative foundation at each of the four sites are provided in the following paragraphs.

The Preferred Alternative also included a 240 m long retaining wall up to 4 m high along the new West Service Road (Woodland Glen Drive extension) from Sta. 10+350 to 10+590. Based on the general subsoil conditions inferred at Stone Road and Downey Road, and subject to confirmation during preliminary and detail design, conventional construction of the retaining wall is anticipated.



7.2 College Avenue NB and SB Overpasses

7.2.1 General Comments

The College Avenue new pavement grade will be at about elevation 321.5, some 6 m below the Hanlon Expressway pavement grade. Based on the subsurface conditions previously encountered at this site, it is feasible to found these NB and SB overpasses on spread footings or driven steel H-piles.

The scheme with pile foundations will likely require pre-augering through the stony till soils to accommodate the structural requirement for a minimum pile length of 5 m.

The inferred founding conditions and preliminary founding parameters for spread footings and driven steel H-pile foundations are provided below for planning purpose only.

College Avenue NB and SB Overpasses						
Foundation Type	Reference Founding Data			Inferred Founding Conditions	Preliminary Geotechnical Resistances ⁽¹⁾	
	Source	Depth (m) ⁽²⁾	Elevation		Factored at ULS	At SLS
Spread Footings	MTO report GEOCRES 40P-20	5 to 6	321 to 322	Dense sand and gravel or fine sand	900 kPa	375 kPa
Driven Steel H-Piles	MTO report GEOCRES 40P-20	10 to 12	315 to 317	Hard clayey silt till	1,800 kN	N/A ⁽⁴⁾
		16 to 18	309 to 311	Limestone Bedrock ⁽³⁾		

NOTES:

- (1) Preliminary Geotechnical Resistances for driven steel piles refer to the HP 310x110 section.
- (2) Depths are estimated from existing ground surface. Minimum frost protection depth of 1.2 m to be provided. Footings perched at or 0.5 m above the road grades were assumed.
- (3) Piles founded on the limestone bedrock or hard till soils to obtain the minimum 5 m free pile length will require pre-augering of the dense/hard soil cover. The resistance for foundation on the limestone bedrock was reduced due to potential damage from driving through boulders.
- (4) Geotechnical Resistance at SLS is not applicable since the load to induce 25 mm of settlement of the piles would be higher than the ULS capacity.

7.2.2 Overview Assessment

Based on the previous preliminary data, the following are the relative advantages and disadvantages of the potential foundation schemes for the College Avenue overpasses.



Foundation Type	Advantages	Disadvantages
Spread footings	Ease of installation Lower cost than deep foundations Allows semi-integral abutment design	Requires removal of boulders from foundation footprint
Footings on Structural Fill	Not applicable for this site	Not applicable for this site
Driven piles	Allows design of integral abutments Higher capacity than spread footings	Higher cost than spread footings Requires driving shoes Pre-augering required to obtain minimum pile length of 5 m.
Caissons	Higher capacity than spread footings Allows semi-integral abutment design	Difficult installation due to potential boulders Higher cost than spread footings

From the foundations perspective, the preferred alternative for these overpasses are spread footings placed on the native soils. These foundations will be suitable for construction of rigid frame reinforced concrete structures or semi-integral abutments which are considered suitable for the relatively short spans of the proposed overpasses.

7.3 Stone Road Interchange Underpass

7.3.1 General Comments

The top of the deck of the interchange underpass at Stone Road is planned at about elevations 335.5 to 336.0. These grades are about 10.5 to 11.0 m above the ground surface to the east and west of the Hanlon Expressway, respectively.

It is inferred from existing data near the site that construction of the underpass abutment foundations on spread footings bearing on native soils or structural fill or deep foundations comprising driven H-piles or drilled caissons is feasible at this site. Foundations bearing directly on the bedrock underlying the site of the structure at 44 to 52 m depths are not practical in view of the overlying competent till soils. The foundations should bear on the locally competent native soils.

The pier for the two-span underpass should be founded on a spread footing constructed within the median of the highway.



The inferred founding conditions and preliminary founding parameters for spread footings and driven steel H-pile foundations are provided below for planning purpose only.

Stone Road Interchange Underpass						
Foundation Type	Reference Founding Data			Inferred Founding Conditions	Preliminary Geotechnical Resistances ⁽¹⁾	
	Source	Depth (m) ⁽²⁾	Elevation		Factored at ULS	At SLS
Spread Footings	Previous PML Reports	~1.5 to 2.0	Not established	Typically compact sand/silty sand/silt	450 kPa	250 kPa
Driven Steel H-Piles	Previous PML Reports	~20.0	~313	Very dense Silt till/ sand and gravel	1,600 kN	1,150 kN

NOTES:

- (1) Preliminary Geotechnical Resistances for driven steel piles refer to the HP 310x110 section.
- (2) Depths are estimated from existing ground surface. Minimum frost protection depth of 1.2 m to be provided. Footings founded on the native soils were assumed.
- (3) Piles founded on the very dense till/gravelly soils will require pre-augering of the dense/hard soil cover.

7.3.2 Overview Assessment

Based on the previous data, the following are the relative advantages and disadvantages of the potential foundation schemes for the Stone Road interchange underpass.

Foundation Type	Advantages	Disadvantages
Spread footings	Ease of installation Lower cost than deep foundations Allows semi-integral abutment design	Relatively low geotechnical resistance of native soils
Footings on Structural Fill	Reduced height of abutment wall Allows semi-integral abutment design Improved geotechnical resistance	Construction of structural fill pad is required
Driven piles	Allows design of integral abutments Higher capacity than spread footings	Higher cost than spread footings Driving shoes required due to potential presence of boulders
Caissons	Higher capacity than spread footings Allows semi-integral abutment design	Difficult installation due to boulders Higher cost than spread footings

From the foundations perspective, the preferred alternative foundation scheme for the proposed underpass at this site is the integral abutment using driven steel H-piles in view of the standard construction of the piles and the long-term savings on maintenance costs.



7.4 Kortright Road/Downey Road NB and SB Overpasses

7.4.1 General Comments

The Kortright Road/Downey Road new pavement grades will be at about elevation 317, some 6 to 7 m below the Hanlon Expressway pavement. It is considered feasible to construct these overpasses on spread footings or driven steel H-piles. The installation of drilled caisson foundations will be impractical due to the presence of boulders at the structure sites. The driving of steel H-piles to achieve 5 m lengths will likely need augered pilot holes due to the presence of boulders.

The inferred founding conditions and preliminary founding parameters for spread footings and driven steel H-pile foundations are provided below for planning purpose only.

Kortright Road/ Downey Road Overpasses						
Foundation Type	Reference Founding Data			Inferred Founding Conditions	Preliminary Geotechnical Resistances ⁽¹⁾	
	Source	Depth (m) ⁽²⁾	Elevation		Factored at ULS	At SLS
Spread Footings	Previous PML and Others' Reports	5 to 6	317 to 318	Compact to very dense or very stiff Till	400 kPa	250 kPa
Driven Steel H-Piles	Previous PML and Others' Reports	12 to 13	310 to 311	Limestone bedrock ⁽³⁾	1,800 kN	N/A ⁽⁴⁾

NOTES:

- (1) Preliminary Geotechnical Resistances for driven steel piles refer to the HP 310x110 section
- (2) Depths are estimated from existing ground surface. Minimum frost protection depth of 1.2 m to be provided. Footings perched at or 1 m above the road grades were assumed.
- (3) Piles founded on the limestone bedrock will require pre-augering of the dense/hard soil cover. The resistance for foundation on the limestone bedrock was reduced due to potential damage from driving through boulders.
- (4) Geotechnical Resistance at SLS is not applicable since the load to induce 25 mm of settlement of the piles would be higher than the ULS capacity.



7.4.2 Overview Assessment

Based on the previous data, the following are the relative advantages and disadvantages of the potential foundation schemes for Kortright Road/Downey Road overpasses.

Foundation Type	Advantages	Disadvantages
Spread footings	Ease of installation Lower cost than deep foundations Allows semi-integral abutment design	Requires removal of boulders from foundation footprint
Footings on Structural Fill	Not applicable for this site	Not applicable for this site
Driven piles	Allows design of integral abutments Higher capacity than spread footings	Higher cost than spread footings Requires driving shoes due to potential presence of boulders Pre-augering required to obtain minimum pile length of 5 m.
Caissons	Not applicable due to the presence of boulders	Not applicable due to the presence of boulders

From the foundations perspective, the preferred alternative for these overpasses are spread footings placed on the native soils. These foundations will be suitable for construction of rigid frame reinforced concrete structures or semi-integral abutments, which are considered suitable for the relatively short spans of the proposed overpasses.

7.5 Laird Road Interchange Underpass

7.5.1 General Comments

The top of the deck of the interchange underpass at Laird Drive is planned at about elevation 339.0. This grade is about 7.5 to 9.0 m above the ground surface west and east of the Hanlon Expressway at Laird Road.

The very dense nature of the native glacial till soils at this site indicates that the underpass foundations are feasible on spread footings placed on native soil or structural fill. The installation of driven steel H-piles is also feasible, however augering of pilot holes will likely be required to achieve the minimum 5 m lengths for structural design.



The inferred founding conditions and preliminary founding parameters for spread footings and driven steel H-pile foundations are provided below for planning purpose only.

Laird Road Interchange Underpass						
Foundation Type	Reference Founding Data			Inferred Founding Conditions	Preliminary Geotechnical Resistances ⁽¹⁾	
	Source	Depth (m) ⁽²⁾	Elevation		Factored at ULS	At SLS
Spread Footings	Previous PML Reports	~1.2	330.0	Very dense sand and gravel or till	900 kPa	450 kPa
Driven Steel H-Piles	Previous PML Reports	3 to 5	326 to 328	Very dense sand and gravel or till ⁽³⁾	1,600 kN	1,150 kN

NOTES:

- (1) Preliminary Geotechnical Resistances for driven steel piles refer to the HP 310x110 section
- (2) Depths are estimated from existing ground surface. Minimum frost protection depth of 1.2 m to be provided.
- (3) Piles founded on the limestone bedrock or very dense till/gravelly soils will require pre-augering of the dense/hard soil cover. .

7.5.2 Overview Assessment

Based on the previous data, the following are the relative advantages and disadvantages of the potential foundation schemes for Laird Road interchange underpass.

Foundation Type	Advantages	Disadvantages
Spread footings	Ease of installation Lower cost than deep foundations Allows semi-integral abutment design	Requires removal of boulders from foundation footprint
Footings on Structural Fill	Reduced height of abutment wall Allows semi-integral abutment design	Construction of structural fill pad is required
Driven piles	Allows construction of integral abutments Higher capacity than spread footings	Higher cost than spread footings Pre-augering required due to the presence of boulders to obtain minimum 5 m lengths Driving shoes required due to presence of boulders
Caissons	Not applicable due to presence of boulders	Not applicable due to presence of boulders



From the foundations perspective, the preferred alternative foundation scheme for the proposed underpass at this site is the integral abutment of driven steel piles in view of the long term savings on maintenance costs.

The pier for the two-span underpass should be founded on a spread footing constructed within the median of the highway.

7.6 Approach Embankments and Earth Cuts

It is estimated that the approach embankments at Stone Road and Laird Road will be 8 to 11 m high. The following ramp sections are planned with relatively high fills over 4 m high:

INTERCHANGE	RAMP	LOCATION	LENGTH (m)	FILL HEIGHT (m)
Stone Road	W-S	Sta. 9+420 to 9+650	230	4 to 11
	E-N	Sta. 9+510 to 9+550	40	4 to 10.5
	W-N	Sta. 9+580 to 9+680	100	4 to 9
	E-S	Sta. 9+580 to 9+770	190	4 to 10
	N-E/W	Sta. 10+400 to 10+440	40	4 to 8
	S-E/W	Sta. 10+280 to 10+400	120	4 to 7
	S-E	Sta. 9+980 to 10+100	120	4 to 6
Laird Road	W-S	Sta. 9+520 to 9+660	140	4 to 6
	E-N	Sta. 9+480 to 9+580	100	4 to 6
	E-S	Sta. 9+620 to 9+860	240	4 to 8
	N-E	Sta. 10+220 to 10+400	180	4 to 8
	S-E/W	Sta. 10+360 to 10+400	40	4 to 5

We anticipate that the existing native compact to dense mainly cohesionless soils will provide a competent bearing surface for the approach fill embankments and new ramps. The settlements of the embankment and native soils will be within tolerable limits.

It is anticipated that the embankments will be constructed with earth fill in view of the locally available materials. The construction of embankments will be possible following conventional MTO procedures at the two underpass locations. Earth fill slopes higher than 8 m will need a mid-height bench in accordance with MTO standards (OPSD-202.010).



These earth fill embankments will be stable at slopes of 2H:1V. The settlements would occur during and/or within two to four months after the placement of the embankments in view of the generally cohesionless native soils.

The 6 to 8 m deep earth cuts for the overpasses at College Avenue and Kortright Road/Downey Road will be made through typical cohesionless native soils and the existing pavement structures of the Hanlon Expressway. The sections where deep cuts over 4 m will occur are as follows:

OVERPASSES AT	LOCATION	LENGTH (m)	CUT DEPTH (m)
College Avenue	Sta. 9+820 to 9+880	60	Up to 8
	Sta. 10+020 to 10+180	160	Up to 5
Kortright Road/Downey Road	Sta. 9+840 to 9+980	140	Up to 7
	Sta. 10+020 to 10+160	140	Up to 6

The earth cuts should be constructed according to MTO standard procedures. The earth cut slopes will be stable at the standard MTO slope configuration of 2H:1V for earth fill, however, these slopes may need to be flattened for deep cuts over 4.5 m depending on local soil conditions and drainage.

Erosion protection should be provided on the cut and fill slopes during and after construction due to the mainly cohesionless nature of the native soils and earth fill materials.

7.7 Excavation Considerations and Drainage

All excavations at the structure foundation sites should be carried out in accordance with the Occupational Health and Safety Act (OHSA), local and MTO regulations. For this purpose, the topsoil, cohesionless silty or sandy soils encountered in the boreholes are considered Type 3 soils. The discontinuous very stiff to hard clayey silt soils are Type 2 soils and the limestone bedrock is a Type 1 soil, according to OHSA.

Rock excavation would not be needed for the present configuration of the proposed structures and contemplated grading works.



Protection systems should be considered for the estimated 8 m deep (or deeper) excavations required at the overpasses to maintain traffic on adjacent roads/highway lanes during traffic staging.

Groundwater observed in the boreholes during the course of previous field work carried out near the various sites was several metres below the existing ground surface and generally below the pavement and structure founding levels. Construction dewatering of the excavations should be readily handled by conventional sump pumping techniques to remove seepage from more pervious layers or surface water infiltration. The groundwater levels are subject to fluctuations due to seasonal patterns or precipitation patterns and these levels should be checked during subsequent site investigations.

In view of the typically cohesionless and relatively pervious subsoil in the area, permanent drainage of cut slopes and of the sags under the overpasses should be considered during the subsequent geotechnical (and hydrological) studies.

8. ADDITIONAL STUDIES

The foundation assessments in this report are preliminary only and are based on a limited literature review and site reconnaissance survey. The previous boreholes reflect the site conditions at the time of the investigations and the near-surface site conditions are likely to have changed due to site grading for previous or on-going site development. More detailed preliminary investigations and/or detail design investigations should be carried out for each of the sites. The interpretation and recommendations are provided only for planning and feasibility studies.

The existing investigation at College Avenue is considered adequate as a preliminary investigation for that site should the final alignment be near the alignment investigated.



The following items should be considered for the additional foundation design studies.

1. Carry out the complete scope of preliminary and detailed field investigations at the Stone Road, Kortright Road/Downey Road and Laird Road sites.
2. Carry out the complete scope of detailed field investigations at the College Avenue overpass.
3. Carry out the complete scope of preliminary and detailed investigations for the new 240 m long retaining wall along the west Service Road (Woodland Glen Drive Extension).
4. Carry out a hydrogeological site assessment at College Avenue and Kortright Road/Downey Road to evaluate the effect of the regional groundwater levels and permanent drainage on the proposed road cuts and grades and the impact of the construction dewatering on the existing water wells (if any), structures in the vicinity of the proposed construction as well as the potential adverse impacts of dewatering on the adjacent creek's base flow.

In general, the hydrogeological site assessment should be conducted in compliance with Section 3.3 (Groundwater) of the MTO's Environmental Reference to Highway Design (ERHD), Version October 2006.

The minimum scope of field work for the hydrogeological site assessment HSA should include a water well survey in the area of the overpasses and sampled boreholes with monitoring well installations, one at each of the four quadrants of each overpass site. The monitoring wells should be monitored for a period of time including spring and fall. The permeability of the strata should be evaluated by means of slug tests in each of the monitoring wells. A contingency allowance should be carried in the assessment program for a pumping test per overpass site subject to the results of the slug tests and well survey program. Based on the HSA's findings, the need for application for Permit-To-Take-Water with the MOE, if the construction dewatering rate is more than 50,000 L/day, should be evaluated.



9. CLOSURE

A site specific subsurface investigation or laboratory testing program were not carried out for this study. The relevant data was taken from previous investigations carried out in the general area of each of the structures and was considered adequate for the purposes of this report.

This report was prepared by Mr. C. M. P. Nascimento, P.Eng. with the assistance of Mr. N. Rahman, BSc, and reviewed by Mr. B. R. Gray, MEng, P.Eng., MTO Designated Principal Contact.

Yours very truly,

Peto MacCallum Ltd.



C. M. P. Nascimento, P.Eng.
Senior Foundation Engineer



Brian R. Gray, MEng, P.Eng.
MTO Designated Contact

CN/BRG:cn-mi

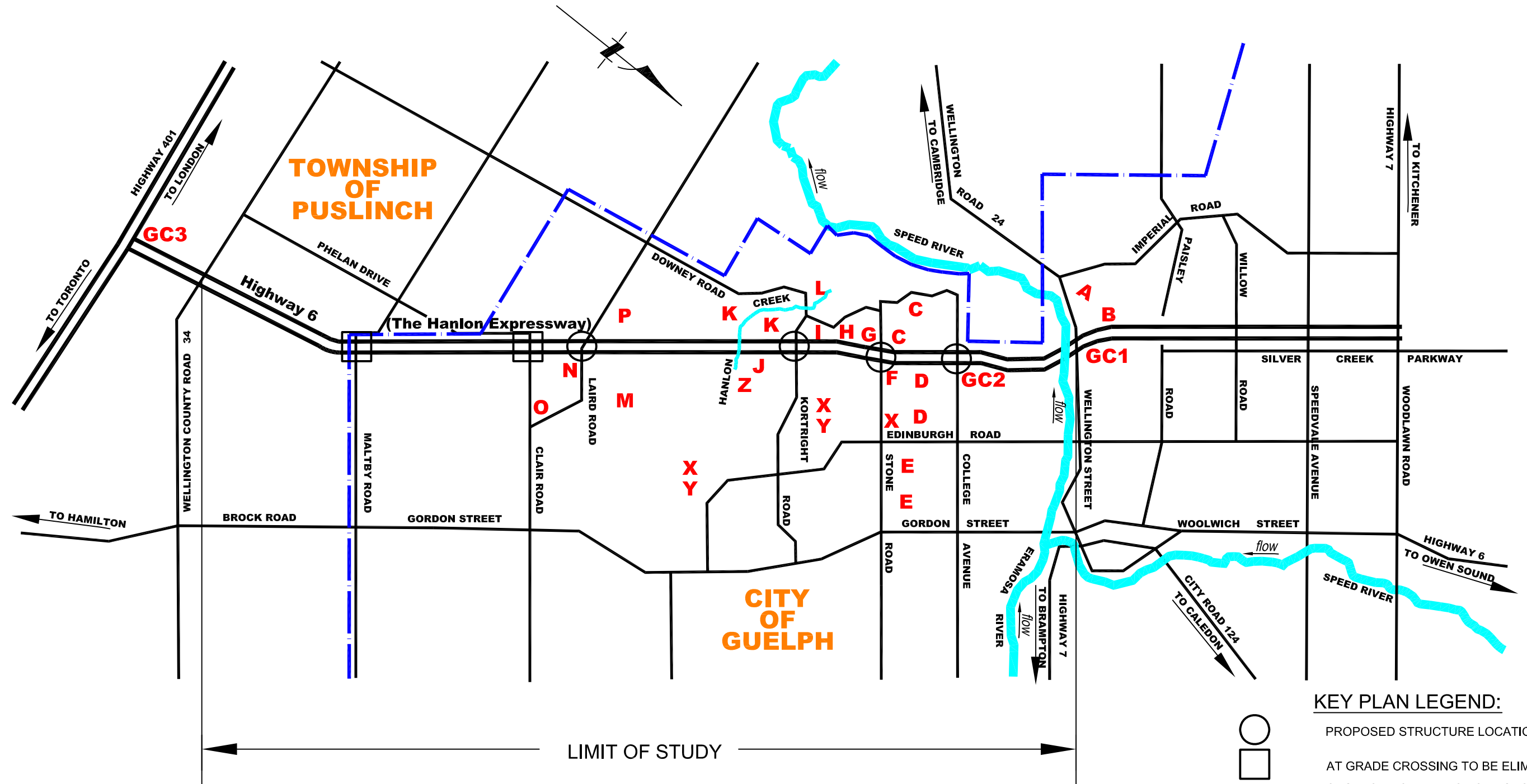


TABLE 1
PRELIMINARY REFERENCE FOUNDATION CONDITIONS

Bridge Site	Foundation Type	Reference Founding Data			Inferred Founding Conditions	Preliminary Geotechnical Resistances ⁽¹⁾	
		Source	Depth (m) ⁽²⁾	Elevation		Factored at ULS	At SLS
College Avenue NB and SB Overpasses	Spread Footings	MTO report GEOCRE 40P-20	5 to 6	321 to 322	Dense sand and gravel or fine sand	900 kPa	375 kPa
	Driven Steel H-Piles	MTO report GEOCRE 40P-20	10 to 12 ----- 16 to 18	315 to 317 ----- 309 to 311	Hard clayey silt till ----- Limestone bedrock ⁽³⁾	1,800 kN	N/A ⁽⁴⁾
Stone Road Interchange Underpass	Spread Footings	Previous PML Reports	~1.5 to 2.0	Not established	Typically compact sand/silty sand/silt	450 kPa	250 kPa
	Driven Steel H-Piles	Previous PML Reports	~20.0	~313	Very dense Silt till/sand and gravel	1,600 kN	1,150 kN
Kortright Road / Downey Road NB and SB Overpasses	Spread Footings	Previous PML and Others' Reports	5 to 6	317 to 318	Compact to very dense or very stiff Till	400 kPa	250 kPa
	Driven Steel H-Piles	Previous PML and Others' Reports	12 to 13	310 to 311	Limestone bedrock ⁽³⁾	1,800 kN	N/A ⁽⁴⁾
Laird Road Interchange Underpass	Spread Footings	Previous PML Reports	~1.2	330.0	Very dense sand and gravel or till	900 kPa	450 kPa
	Driven Steel H-Piles	Previous PML Reports	3 to 5	326 to 328	Very dense sand and gravel or till ⁽³⁾	1,600 kN	1,150 kN

NOTES:









- (1) Preliminary Geotechnical Resistances for driven steel piles refer to the HP 310x110 section.
- (2) Depths are estimated from existing ground surface. Minimum frost protection depth of 1.2 m to be provided.
- (3) Piles founded on the limestone bedrock or very dense till/gravelly soils will require pre-augering of the dense/hard soil cover. The resistance for foundation on the limestone bedrock was reduced due to potential damage from driving through boulders.
- (4) Geotechnical Resistance at SLS is not applicable since the load to induce 25 mm of settlement of the piles would be higher than the ULS capacity.



NOTE: SKETCH NOT TO SCALE.

REFERENCE: THIS DRAWING WAS REPRODUCED FROM FIGURE 1.1 - 'STUDY AREA EXISTING ROAD NETWORK' PREPARED BY UMA ENGINEERING IN REPORT FOR WP 56-00-00

KEY PLAN LEGEND:

-  PROPOSED STRUCTURE LOCATIONS.
-  AT GRADE CROSSING TO BE ELIMINATED.
-  A to P
X, Y, Z
GC1
GC2
GC3
GEOTECHNICAL INVESTIGATIONS CONDUCTED BY PETO MACCALLUM LTD.
-  CITY OF GUELPH REPORTS.
-  MTO GEOCREs No. 40P9 - 18
-  MTO GEOCREs No. 40P9 - 20
-  MTO GEOCREs No. 40P8 - 64
-  MUNICIPAL BOUNDARY

KEY PLAN

METRIC

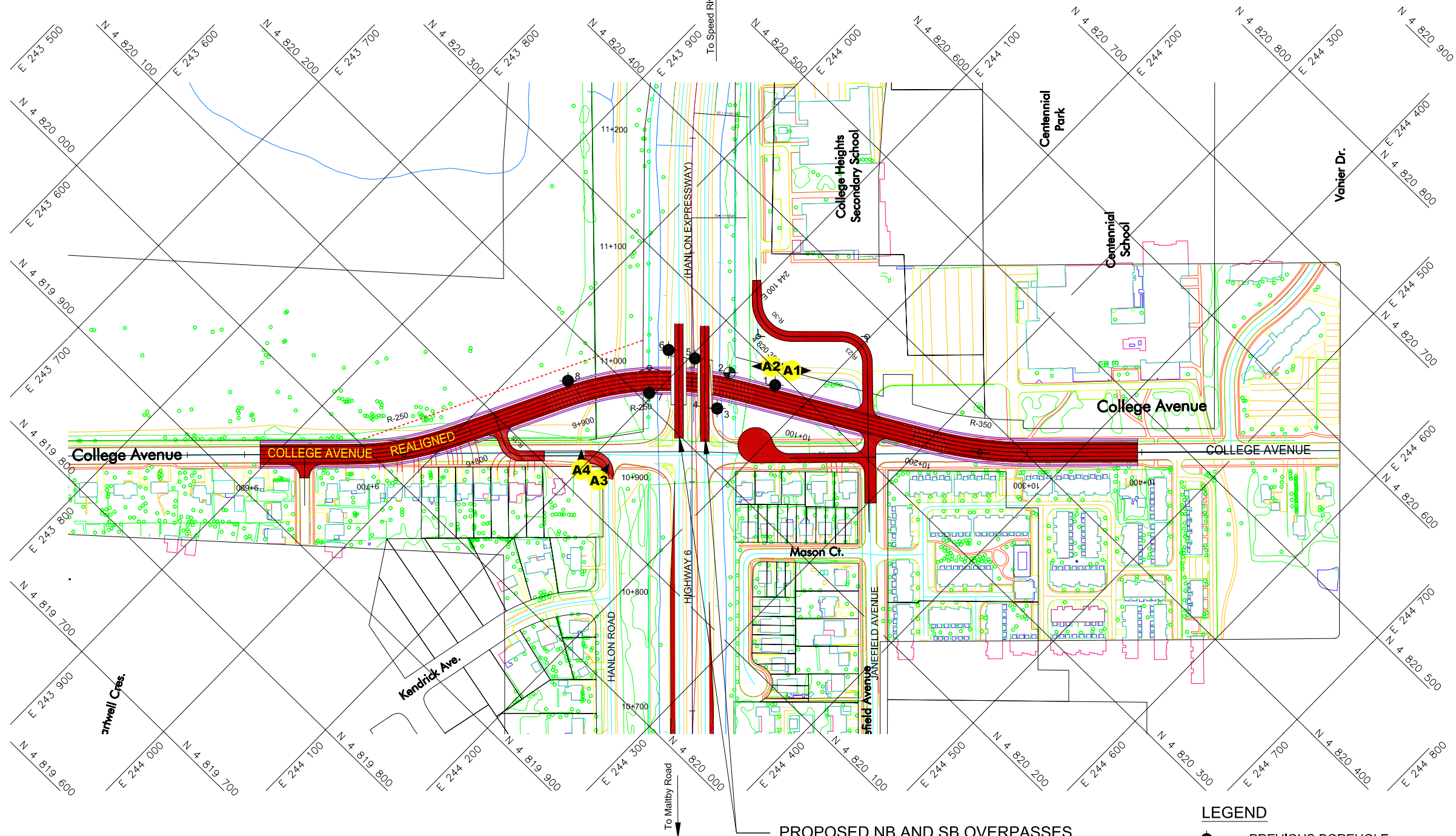
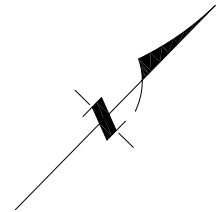


GEOCREs No.: 40P9-42
G.W.P. No.: 3002-05-00

HIGHWAY 6 (HANLON EXPRESSWAY)
FROM SPEED RIVER TO
WELLINGTON COUNTY ROAD 34



DRAWING
A



PROPOSED NB AND SB OVERPASSES

LEGEND

- PREVIOUS BOREHOLE
- ⊕ PREVIOUS BOREHOLE & CONE
- A4 LOCATION, NUMBER AND DIRECTION OF PHOTOGRAPH

NOTE: FOR BOREHOLE DETAILS REFER DRAWING 987502-A DATED JANUARY 16, 1976 (APPENDIX 'C' OF REPORT)

GEOCRES No.: 40P9-42

REFERENCE: THIS DRAWING WAS REPRODUCED FROM STANTEC DRAWING HANLON\631_Recommended_Plan.dwg dated April 14, 2009.

COLLEGE AVENUE OVERPASS
HIGHWAY 6 (HANLON EXPRESSWAY)

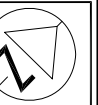
METRIC

SITE PLAN

SCALE



HIGHWAY 6 (HANLON EXPRESSWAY)
From Maltby Road to the Speed River
GWP No 3002-05-00



DRAWING
1



REFERENCE: THIS DRAWING WAS REPRODUCED FROM STANTEC DRAWING
HANLON\631_Recommended_Plan.dwg dated April 14, 2009.

PML REF. 81F98

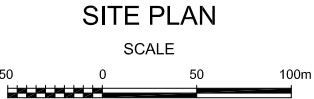


NOTE:

- LEGEND**
- REFERENCE REPORT
 - PREVIOUS BOREHOLE
 - LOCATION, NUMBER AND DIRECTION OF PHOTOGRAPH
 - FOR DETAILS OF REFERENCE REPORTS SEE APPENDIX 'C' OF THIS REPORT
 - GEOCRES No.: 40P9-42

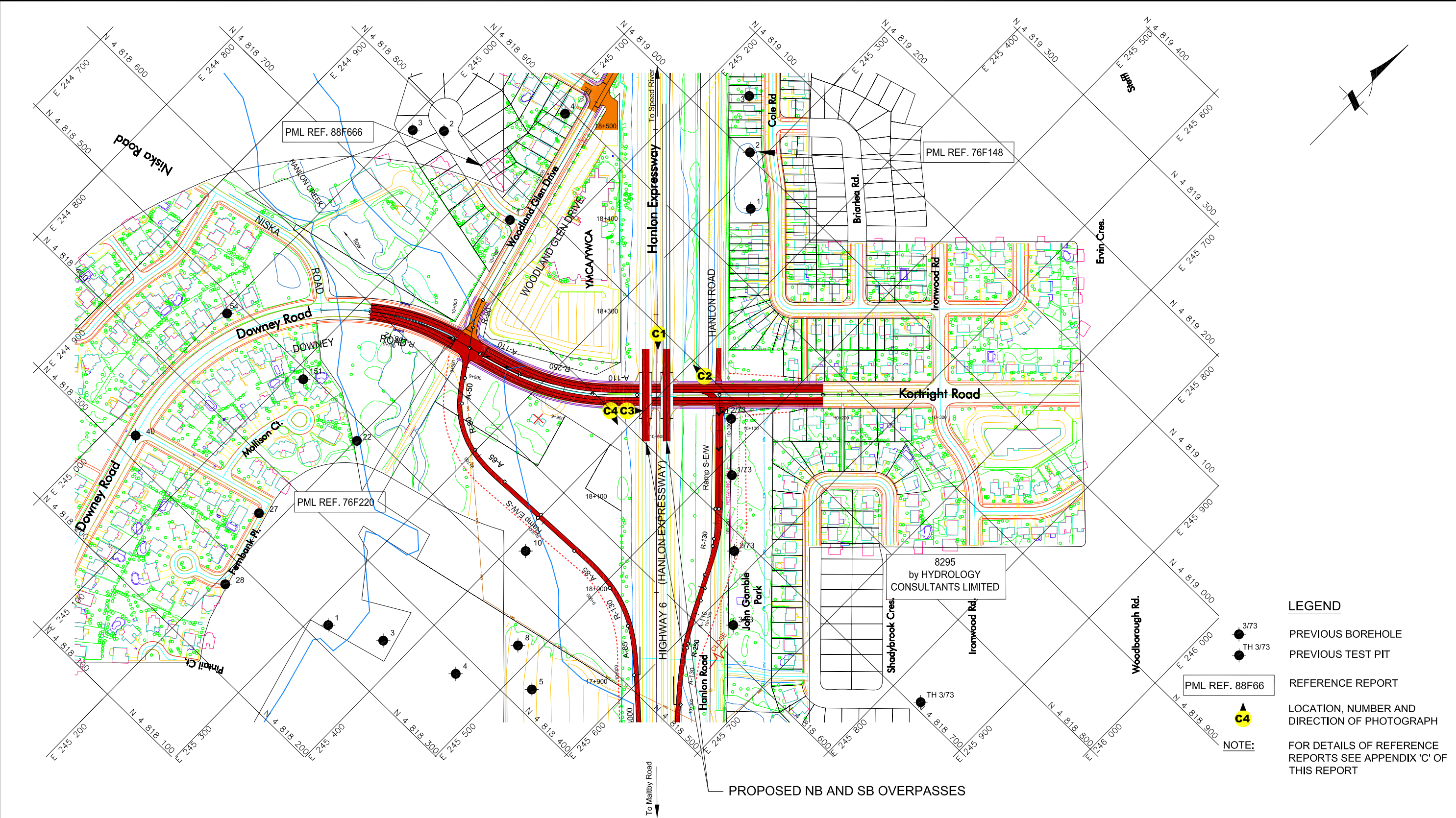
STONE ROAD UNDERPASS
HIGHWAY 6 (HANLON EXPRESSWAY)

METRIC



Ontario
PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

Stantec Consulting Ltd.
HIGHWAY 6 (HANLON EXPRESSWAY)
From Maltby Road to the Speed River
GWP No 3002-05-00
DRAWING 2

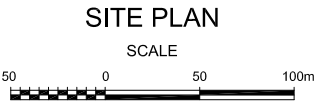


REFERENCE: THIS DRAWING WAS REPRODUCED FROM STANTEC DRAWING
HANLON\631_Recommended_Plan.dwg dated April 14, 2009.

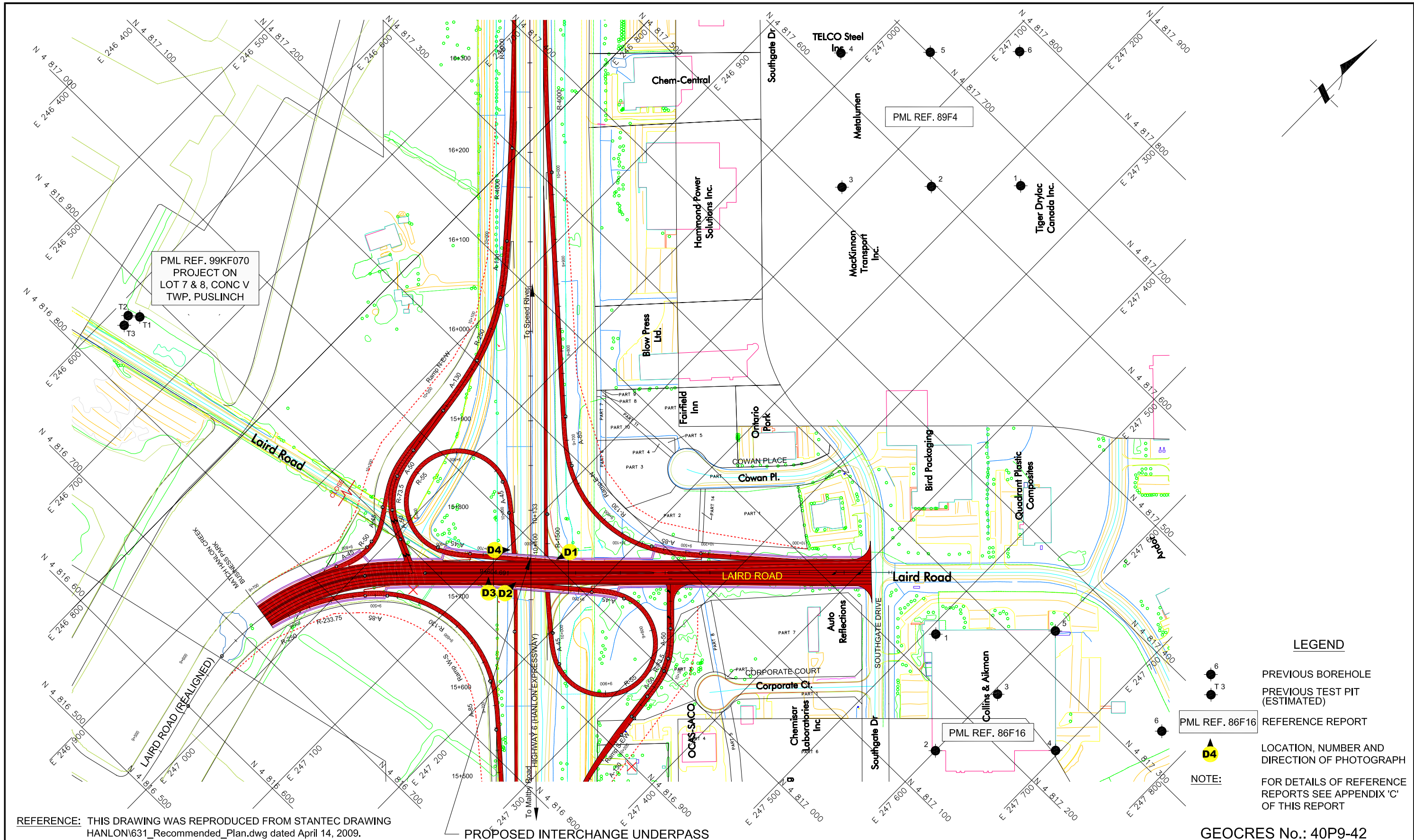
GEOCRES No.: 40P9-42

KORTRIGHT ROAD OVERPASS
HIGHWAY 6 (HANLON EXPRESSWAY)

METRIC



	Stantec Consulting Ltd.	
HIGHWAY 6 (HANLON EXPRESSWAY) From Maltby Road to the Speed River GWP No 3002-05-00		DRAWING 3



REFERENCE: THIS DRAWING WAS REPRODUCED FROM STANTEC DRAWING
HANLON1631_Recommended_Plan.dwg dated April 14, 2009.

PROPOSED INTERCHANGE UNDERPASS

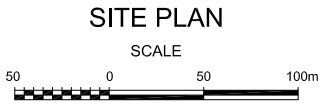
LEGEND

- PREVIOUS BOREHOLE
- PREVIOUS TEST PIT (ESTIMATED)
- REFERENCE REPORT
- LOCATION, NUMBER AND DIRECTION OF PHOTOGRAPH
- NOTE: FOR DETAILS OF REFERENCE REPORTS SEE APPENDIX 'C' OF THIS REPORT

GEOCRES No.: 40P9-42


LAIRD ROAD UNDERPASS HIGHWAY 6 (HANLON EXPRESSWAY)

METRIC




 **Ontario**

 **Peto MacCallum Ltd.**
CONSULTING ENGINEERS

 **Stantec Consulting Ltd.**

HIGHWAY 6 (HANLON EXPRESSWAY)
From Maltby Road to the Speed River
GWP No 3002-05-00



DRAWING
4

EXPLANATION OF TERMS USED IN REPORT

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS \bar{N} .

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

c_u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 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.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

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

JOINTING AND BEDDING:

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	> 3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE
F V	FIELD VANE		

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa^{-1}	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m^2/s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m^3	DENSITY OF SOLID PARTICLES	n	1, %	POROSITY	e_{max}	1, %	VOID RATIO IN LOOSEST STATE
γ_s	kN/m^3	UNIT WEIGHT OF SOLID PARTICLES	w	1, %	WATER CONTENT	e_{min}	1, %	VOID RATIO IN DENSEST STATE
ρ_w	kg/m^3	DENSITY OF WATER	S_r	%	DEGREE OF SATURATION	I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
γ_w	kN/m^3	UNIT WEIGHT OF WATER	w_L	%	LIQUID LIMIT	D	mm	GRAIN DIAMETER
ρ	kg/m^3	DENSITY OF SOIL	w_p	%	PLASTIC LIMIT	D_n	mm	n PERCENT - DIAMETER
γ	kN/m^3	UNIT WEIGHT OF SOIL	w_s	%	SHRINKAGE LIMIT	C_u	1	UNIFORMITY COEFFICIENT
ρ_d	kg/m^3	DENSITY OF DRY SOIL	I_p	%	PLASTICITY INDEX = $w_L - w_p$	h	m	HYDRAULIC HEAD OR POTENTIAL
γ_d	kN/m^3	UNIT WEIGHT OF DRY SOIL	I_L	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	q	m^3/s	RATE OF DISCHARGE
ρ_{sat}	kg/m^3	DENSITY OF SATURATED SOIL	I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	v	m/s	DISCHARGE VELOCITY
γ_{sat}	kN/m^3	UNIT WEIGHT OF SATURATED SOIL	DTPL		DRIER THAN PLASTIC LIMIT	i	1	HYDRAULIC GRADIENT
ρ'	kg/m^3	DENSITY OF SUBMERGED SOIL	APL		ABOUT PLASTIC LIMIT	k	m/s	HYDRAULIC CONDUCTIVITY
γ'	kN/m^3	UNIT WEIGHT OF SUBMERGED SOIL	WTPL		WETTER THAN PLASTIC LIMIT	j	kN/m^3	SEEPAGE FORCE
e	1, %	VOID RATIO						



APPENDIX A

List of Reference Documents

- MTO GEOCRES Library
- Peto MacCallum Ltd. Completed Geotechnical Reports
- City of Guelph Library of Completed Reports
- Geological Reports and Maps



SOURCE: MTO GEOCRES Library

I.D. # (See Key Map)	MTO REFERENCE		PROJECT DESCRIPTION	GEOCRES FILE
	File No.	W.P. No.		
GC 1	72F108	109-68-01	Investigation of Deterioration of the Approach Fill of the Speed River Bridges at Hanlon Expressway	40P9-18
GC 2	-	98-75-02	College Avenue Overpass at Hanlon Expressway	40P9-20 (1)
GC 3	-	118-68-03	Highway 6 and Highway 401 Underpass	40P8-64

Note: (1) Selected report for description of site conditions at the College Avenue Overpass site.

SOURCE: PML Completed Geotechnical Reports

I.D. # (See Key Map)	PML REF. NO.	CLIENT	PROJECT DESCRIPTION
A	82F146A	Gore & Storrie Limited	Water Pollution Control Plant Headworks, Waterloo Avenue
B	73F220	Canadian National Railways	CN Bridge over Hanlon Expressway
C	68F5	City of Guelph	Storm Trunk Sewer, College Avenue, Flanders Road
D	70F35	City of Guelph	Storm Trunk Sewer, Hanlan Road, College Avenue, Edinburgh Road
E	70F36	City of Guelph	Storm Trunk Sewer, Edinburgh Road, Stone Road
F	75F151 (2)	Commonwealth Holiday Inns of Canada Ltd.	Holiday Inn, Hanlon Expressway at Stone Road
G	81F98 (2)	Glenairn Acres Limited	Wood Glen Subdivision, Phase I (65 Lots), Stone Road and Hanlon Expressway
H	83F93	Glenairn Acres Limited	Woodland Glen Subdivision, Phase II (26 Lots), Stone Road and Hanlon Expressway
I	88F666 (3)	City of Guelph	Woodland Glen Subdivision, Phase III (29 Lots), Woodland Glen Drive



I.D. # (See Key Map)	PML REF. NO.	CLIENT	PROJECT DESCRIPTION
J	76F140 (3)	City of Guelph	Hanlon Recharge Pond (Hanlon Creek), Hanlon Parkway North of Kortright Road
K	76F220 (3)	Freure Homes Limited	Residential Subdivision, Phases I and II, Kortright Road and Downey Road
L	88F235	Freure Homes Limited	Future College Avenue Extension
M	89F4 (4)	CRD Construction Ltd.	Metalumen Manufacturing Southgate Drive
N	86F16 (4)	Inducon Consultants of Canada Inc.	Proposed Satellite Manufacturing Plant for American Motor (Can) Inc., Laird Road at Southgate Drive
O	79F264	Pollock-McGibbon Limited	Proposed Pharmaceutical Plant, Hanlon Road and Clair Road
P	99KF070	Private Owner	Septic System Investigation on 6662 Laird Drive

Notes:

- (2) Selected report for description of site conditions at the Stone Road Interchange Underpass site.
- (3) Selected report for description of site conditions at the Kortright Road/Downey Road Overpass site.
- (4) Selected report for description of site conditions at the Laird Road Interchange Underpass site.

SOURCE: City of Guelph Reports

ID # (See Key Map)	CITY OF GUELPH ID #	PROJECT DESCRIPTION	CONSULTANT	DATE
X	1629	Hanlon Creek Ecological Study Phase B	Kilborn Engineering Ltd.	April 1972
Y	1478	A watershed management strategy for the upper Hanlon Creek and its tributaries	Gamsby and Mannerow Ltd.	June 1993
Z	539 (3)	Investigation of Hydrogeologic factors affecting ground recharge of storm runoff, Hanlon Heights Subdivision	Hydrology Consultants Ltd.	July 1973

Note:

- (3) Selected report for description of site conditions at the Kortright Road/Downey Road Overpass site.



Geological Reports/Maps

- The Physiography of Southern Ontario, Third Edition, Ontario Geological Survey, Volume 2 by L.J. Chapman and D.F. Putnam, Ministry of Natural Resources, 1984
- Geological Report 61, "Pleistocene Geology of the Guelph Area" by P.F. Karrow, Ontario Department of Mines, 1968
- Geological Report 105, "Palaeozoic Geology of Southern Ontario" by D.F. Hewitt, Ontario Department of Mines, 1972
- Map No. 2153 (with Geological Report 61) "Pleistocene Geology of the Guelph Area" from the Ontario Department of Mines, 1968, Scale 1 inch to 1 mile
- Preliminary Map P.955, Geological Series, "Palaeozoic Geology of the Guelph Area", Ontario Division of Mines, 1974, Scale 1:50,000
- Preliminary Map P. 535 "Galt-Hamilton Sheet" Southern Ontario, Drift Thickness Series, Ontario Department of Mines, 1969, Scale 1:50,000
- Report No. 35 of the Ontario Soil Survey "Soil Survey of Wellington County, Ontario" by D.W. Hoffman, B.C. Mathews and R.E. Wicklund, Department of Agriculture, Toronto, 1963
- Water Resources Bulletin 2-26 Groundwater Series Water Wells Records for Ontario, Waterloo, Wellington 1946-1976, Ministry of the Environment, 1979
- Aggregate Resources Inventory Map (ARIM) 162-2B Bedrock Resources from the Ontario Geological Survey Wellington County (South), Geology based on work from 1969 and 1979, Scale 1:50,000
- Aggregate Resources Inventory Map (ARIM) 162-1B Sand and Gravel Resources from the Ontario Geological Survey Wellington County (South), Geology based on work from 1969 and 1979, Scale 1:50,000

APPENDIX A-1

Water Well Records

SOURCES:

- Water Resources Bulletin 2-26 Groundwater Series Water Wells Records for Ontario, Waterloo, Wellington 1946-1976, Ministry of the Environment, 1979
- Ministry of the Environment helpdesk@waterwellontario.ca

GUELPH CITY

[illegible]

67- 5007 67- 884	558460 4823440 558477 4822104	1104 03/74 1110 08/57	2336 2414	4 6	FR FR	148 120	20 20	28 30	12 12	1/00 4/00	PS IR	DO								
67- 881 67- 869	558562 4822449 558601 4823643	1125 02/56 1090 09/52	2414 2801	4 10	FR FR	106 5	45 51	50 202	10 16/00	1/00 16/00	ST DO	DO	GUELPH CEMETERY COMM PRDR 0097 BRWN ROCK 0149 GILCREST ESTATE TPSL 0002 CLAY STNS 0020 GRVL 0050 CLAY STNS 0055 WHIT LMSN 0095 BLUE LMSN 0151 HALLIBURTON H PRDR 0087 BLUE LMSN 0097 BRWN LMSN 0118 CITY OF GUELPH BLCK TPSL 0001 GRVL MSND 0009 BLDR 0017 LMSN 0030 WHIT LMSN 0058 GREY LMSN 0097 WHIT LMSN 0103 GREY LMSN 0230 GREY SHLE 0238 MILLER J TPSL 0006 GRVL MSND 0011 CLAY MSND 0028 GRVL 0031 CLAY 0036 GRVL MSND 0040 CARLTON J M BLUE CLAY BLDR 0050 WHIT LMSN 0072 BRWN LMSN 0090 BLUE LMSN 0104 CITY OF GUELPH TPSL 0001 GRVL 0005 BLDR 0006 BLDR GRVL 0012 LMSN 0018 CITY OF GUELPH TPSL 0001 GRVL BLDR 0004 GRVL 0012 LMSN 0020 CITY OF GUELPH BRWN MSND BLDR 0038 BLUE LMSN 0060 WHIT LMSN 0075 BLUE LMSN 0103 GREY LMSN 0118 BLUE LMSN 0134 GREY LMSN 0162 BLUE LMSN 0182 GREY LMSN 0201 BLUE LMSN 0274 BLUE SHLE 0275 UNITED DAIRY POULTRY CLAY BLDR 0022 WHIT LMSN 0033 YLLW LMSN 0094 BRWN LMSN 0104 BLUE LMSN 0150 GREY LMSN 0180 BLUE LMSN 0246 UNITED DAIRY POULTRY TPSL 0001 MSND GRVL 0019 CLAY HPAN 0040 GREY LMSN 0240 CITY OF GUELPH YLLW CLAY 0005 BRWN FSND 0012 HPAN BLDR 0050 BRWN LMSN 0075 WHIT LMSN 0100 GREY LMSN 0126 BRWN LMSN 0145 GREY LMSN 0160 BLUE LMSN 0274							
67- 882	558620 4821293	1100 06/56	2538	4	FR	40	4	20	4	2/00	DO	DO								
67- 862	558643 4821187	1100 04/50	2414	5	FR	65	17		10	3/00	DO	DO								
67- 868	558762 4823685	1085 09/52	2801	10																
67- 867	558770 4823841	1080 09/52	2801	10			8													
67- 861	558789 4820227	1075 12/49	2414	10	FR	75	18	109	130	8/00										
67- 843	558807 4822711	1100 02/49	2414	8	FR	150	18	148	140		IN	IN								
67- 901	558815 4822856	1095 07/65	3518	10	FR FR	70 180	30	200	300	24/00	IN	IN								
67- 860	558830 4820964	1095 09/49	2414	10	FR	75	6	115	160	8/00										

WELLINGTON COUNTY 67

MUNICIPALITY CONCESSION ETC	LOT	UTM WELL EASTING NO NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
GUELPH CITY (CONTINUED....)														
	67- 845	558859 4822770	1095	11/48	2414	12	FR	50	37	157	140	8/00	IN	UNITED DAIRY POULTRY TPSL 0004 GRVL 0013 HPAN BLDR 0028 WHIT LMSN 0095 BLCK LMSN 0113 BLUE LMSN 0125 GREY LMSN 0129 BLUE LMSN 0160 GREY LMSN 0180 BLUE LMSN 0250 NORTHWEST MOTORS LTD MSND 0010 GRVL 0015 CLAY STNS 0026 WHIT LMSN 0048 BLUE CLAY 0050 LMSN 0053 STNS 0059 LMSN 0078 BLUE LMSN 0098 CITY OF GUELPH PEAT 0002 GREY CLAY 0007 CLAY MSND 0032 LMSN MSND 0040 BRWN LMSN 0069 GREY LMSN 0090 BLUE LMSN 0201 GREY LMSN 0231 BLUE LMSN 0268 WOODS W C YLLW CLAY 0021 BLUE CLAY 0024 YLLW CLAY 0038 HPAN 0082 CLAY BLDR 0086 HPAN 0096 GRVL 0098 LMSN 0104 YLLW LMSN 0120 BRWN LMSN 0152 GREY LMSN 0155 WHIT LMSN 0166 SCHELL E BLCK TPSL 0002 BRWN CLAY 0008 BLCK LMSN 0159 RICHTIE JAS PRDG 0007 BRWN CLAY STNS 0015 BRWN LMSN 0040 WHIT ROCK 0065 GREY ROCK 0089 BLCK ROCK 0097 BARBER BLDG BLOCKS CLAY MSND STNS 0019 WHIT LMSN 0070 BRWN LMSN 0105 BLCK LMSN 0120 GREY LMSN 0132 JOHNSON T GRVL CLAY 0026 GREY LMSN 0090 FEDERAL WIRE CABLE C MSND CLAY 0007 MSND 0030 CLAY STNS 0047 GREY LMSN 0080 BRWN LMSN 0120 BLUE LMSN 0269 BLUE SHLE 0272 CORP CITY OF GUELPH TPSL 0001 BLDR GRVL CLAY 0015 GRVL 0023 HPAN 0038 LMSN 0040 RED CLAY LMSN 0108 LMSN 0124 BLCK LMSN 0134 BLUE LMSN 0242 BLUE SHLE 0243 PFAFF R A CLAY BLDR 0009 YLLW LMSN 0032 BRWN LMSN 0048 BLCK LMSN 0072 BRWN LMSN 0078 GREY LMSN 0109 BLUE LMSN 0150 CORP CITY OF GUELPH TPSL 0002 FSND 0006 GRVL STNS 0015 GREY HPAN STNS 0045 BRWN CLAY CSND 0055 BRWN LMSN 0067 YLLW LMSN 0146 BLUE LMSN 0165 WHIT LMSN 0196 BLUE LMSN 0220 WHIT LMSN 0238 BLUE LMSN 0265 BLUE SHLE 0268
	67- 844	558867 4823001	1083	06/48	2414	5	FR	78	19	43		2/00	IN	
	67- 859	558895 4821249	1100	08/49	2414	10	FR	100	7	116	240	8/00		
	67- 842	558984 4821825	1100	03/47	2414	5	FR	47	47	59	10	6/00	DO	
	67- 6277	559080 4818420	1030	10/76	5469	4	FR FR	106 157			6	2/00	DO	
	67- 4732	559080 4818640	1032	07/73	2406	5	FR	87	26	50	12	1/00	DO	
	67- 864	559271 4820224	1075	07/51	2414	6	SU	70	8	18	20	1/00	IN	
	67- 916	559278 4819411	1025	03/66	2521	4	FR	90	13	75	8	1/00	CO	
	67- 863	559326 4821232	1075	12/50	2414	10	FR	50	35	75	111	7/00	IN	
	67- 886	559585 4824280	1125	04/58	2414	12	FR	200	15	150	25	1/00	MU	
	67- 838	559607 4819918	1025	09/46	2414	6	MN	40	33	43	50	4/00	IN	
	67- 887	559654 4824570	1140	06/58	2414	6	FR FR	70 256	16	57	150	15/30	MU	

67- 559904 872 4822839	1105 03/53	2414	10	FR	152	84	148	140	8/00	PS	HOMEWOOD SANITARIUM HPAN STNS 0037 BRWN LMSN 0045 BRWN CLAY 0047 BRWN LMSN 0119 WHIT LMSN 0152 BRWN LMSN 0175 BLUE LMSN 0270 GUELPH PUC OBDN 0037 DLMT 0152 CITY OF GUELPH CLAY BLDR 0031 WHIT LMSN 0037 BRWN LMSN 0064 BLCK LMSN 0085 BRWN LMSN 0108 GREY LMSN 0119 BLUE LMSN 0161 BRWN LMSN 0196 GREY LMSN 0210 BLUE LMSN 0225 SWEET P GRVL 0030 CLAY 0046 GREY LMSN 0132 GUELPH PUC OBDN 0040 DLMT 0202 CITY OF GUELPH TPSL 0003 GRVL CLAY 0006 GRVL 0011 STNS CLAY 0017 WHIT LMSN 0048 BRWN LMSN 0064 BLCK LMSN 0103 BLUE MUCK 0104 BLCK LMSN 0119 GREY LMSN 0135 BLUE LMSN 0240 BLUE SHLE 0241 YEATS CHAS CO LTD HPAN BLDR 0020 WHIT LMSN 0073 BRWN LMSN 0096 BLCK LMSN 0118 BLUE LMSN 0182 WHIT LMSN 0212 CITY OF GUELPH GRVL 0011 LMSN 0022 BLCK LMSN 0055 GREY LMSN 0188 BLUE SHLE 0190 HOME CREAMERY CO LTD PRDR 0072 BLUE LMSN 0095 GREY LMSN 0126 SMITH E BRWN CLAY 0020 BRWN LMSN 0048 WHIT LMSN 0075 GREY LMSN 0086 KENNEDY D E BRWN CLAY 0030 HPAN 0068 BLUE CLAY BLDR 0072 WHIT LMSN 0141 CITY OF GUELPH HPAN STNS BLDR 0026 YLLW LMSN 0042 BRWN LMSN 0069 BLCK LMSN 0080 BRWN LMSN 0103 GREY LMSN 0114 BLUE LMSN 0156 CITY OF GUELPH ONT TPSL GRVL 0010 GRVL MSND 0028 WHIT LMSN 0050 BRWN LMSN 0085 SHLE 0087 GREY SHLE 0092 BLCK LMSN 0100 GREY LMSN 0150 WHIT LMSN 0160 GREY LMSN 0168 WHIT LMSN 0173 GREY LMSN 0187 SMITH E RED CLAY 0009 HPAN MSND 0020 YLLW LMSN 0097 CORP OF GUELPH CITY TPSL 0001 FSND 0010 MSND GRVL 0025 CLAY GRVL 0037 BRWN LMSN 0100 GREY LMSN 0110 BLCK LMSN 0155 GREY LMSN 0265 BLUE SHLE 0270 P U C GUELPH TPSL 0001 GRVL CLAY 0010 GRVL MSND 0024 CLAY SILT MSND 0053 GRVL 0056 BRWN LMSN 0098 BLCK LMSN SHLE 0151 GREY LMSN 0173 BLUE LMSN 0263 GREY LMSN 0275 BLUE SHLE 0284
67- 559910 4194 4823150 67- 560165 856 4823187	1085 03/46	0001	12			32					
	1100 04/46	2414	10	FR	80	35	75	80	6/00		
67- 560206 925 4818056 67- 560240 4195 4822835 67- 560241 870 4819662	1060 12/66	2521	4	FR	132	40	80	5	1/00	DO	
	1105 03/46	0001	12			105					
	1030 01/53	2414	10	FR	100	32	62	541	8/00	MU	
67- 560282 866 4821373	1100 05/52	2414	10	FR	100	68	110	120	10/00	IN	
67- 560331 874 4820007	1000 04/53	2801	12	MN		2	116	179	20/00		
67- 560337 865 4821999 67- 560360 849 4820350	1050 11/51	2414		FR	126	26	38	30	3/00	IN	
	1100 08/47	2414	6	FR	48	16	21	10	2/00	DO	
67- 560373 841 4824313	1150 09/46	2414	5	FR	120	36	48	10	4/00	DO	
67- 560419 858 4823057	1100 08/46	2414	8	FR	152	73	90	1450	24/00	MU	
67- 560424 855 4823052	1100 10/46	4620			50	54	76				
67- 560430 850 4820060	1125 04/48	2414	6	FR	90	8	23	5	1/00		
67- 560450 3160 4817650	1050 02/68	2406	6	SU SU SU	100 190 211 245	42	140	50			
67- 560467 891 4819372	1075 05/59	2801	12	FR	59	35					

WELLINGTON COUNTY 67

MUNICIPALITY CONCESSION ETC	LOT	UTM WELL EASTING NO NORTHING	ELEV FEET	DATE	DRILLER	CSG INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
GUELPH CITY (CONTINUED....)														
	67- 940	560474 4818238	1065	11/67	1906	4	FR	60 111	30	80	6	1/00	DO	MATHEWS W T GRVL MSND 0035 WHIT LMSN 0111 BLUE LMSN 0141
	67- 873	560534 4819793	1030	03/53	2801	12	FR		18	74	605	24/00	MU	CITY OF GUELPH BLCK MUCK 0001 CLAY GRVL 0006 GRVL BLDR 0012 GRVL CLAY 0024 BRWN LMSN 0056 BLCK LMSN 0099 GREY LMSN 0166 BRWN LMSN 0187 GREY LMSN 0203 GREY LMSN 0226 BLUE SHLE 0228
	67- 928	560536 4818322	1060	05/67	1906	4	FR	98	25	70	5	1/30	DO	REID AND LAIG LTD GRVL 0036 BRWN LMSN 0098
	67- 942	560541 4818307	1060	11/67	2521	4	FR	108	25	70	7	2/00	DO	GOW D GRVL 0043 GREY LMSN 0108
	67- 929	560560 4818257	1060	07/67	2521	4	FR	108	21	75	5	1/00	DO	REID AND LAING LTD GRVL 0031 GREY LMSN 0108
	67- 875	560659 4820102	1030	05/53	2801	12	FR		19	66	724	27/00	MU	CITY OF GUELPH GRVL BLDR 0011 CLAY SHLE 0017 WHIT LMSN 0024 BRWN LMSN 0029 BLCK LMSN 0045 BLCK DLMT 0058 BLCK LMSN 0071 GREY LMSN 0140 WHIT LMSN 0152 BRWN LMSN 0162 GREY LMSN 0195
	67- 924	560835 4818892	1070	12/66	2521	4	FR	96	21	60	10	2/00	CO	ASMUSSEN LTD GRVL 0030 MSND 0040 GREY LMSN 0096
	67- 935	561082 4818203	1070	06/67	1906	4	FR	170 186	45	55	15	5/00	DO	CLEVELAND J GRVL CLAY 0006 MSND STNS 0030 MSND 0080 GREY CLAY 0111 CLAY MSND 0156 BLUE LMSN 0165 BLCK LMSN 0170 GREY LMSN 0186
	67- 893	561173 4822245	1075	09/60	2414	4	FR	143	95	105	10	2/00	DO	EAGLESHAM D C TPSL 0002 BRWN CLAY STNS 0040 BRWN FSND 0050 GRVL MSND 0090 BRWN LMSN 0143
	67- 3290	561350 4819200	1075	06/68	2406	5	FR SU SU SU	70 130 185 240	35	220	200	4/00		UNIVERSITY OF GUELPH TPSL 0001 BRWN CLAY STNS 0020 GREY CLAY 0042 BRWN LMSN 0105 BLCK LMSN 0145 GREY LMSN 0260 SHLE 0265
	67- 5437	561550 4817000	1040	12/74	1906	4	FR	47 120	6		15	20/00	ST DO	HANLON HARRY M CLAY STNS 0006 GRVL STNS 0015 GREY ROCK 0054 BLCK ROCK 0121
	67- 857	561568 4819837	1075	09/47	2414	6	MN	130	5	17	5	8/00	DO	MCCARTHY C BRWN CLAY MSND 0011 BLUE CLAY 0020 BLDR 0022 GRVL 0026 HPAN 0040 BLUE CLAY STNS 0056 HPAN BLDR 0064 BLUE CLAY 0130
	67- 917	561606 4822503	1050	03/66	2521	4	FR	76	5	25	15	1/00	DO	CIROTTI M BLCK TPSL 0002 CLAY 0010 GRVL 0023 BRWN LMSN 0076
	67- 3244	561800 4818750	1095	10/68	2406	5	FR FR	165 230	65	75	180	8/00		UNIVERSITY OF GUELPH TPSL 0001 BRWN CLAY STNS 0025 GREY CLAY STNS 0059 CSND 0063 BRWN LMSN 0115 BLCK LMSN 0165 GREY LMSN 0255
	67- 880	561845 4821347	1065	07/55	2414	6	SU	114	9	21	55	8/00	IN	OREGON SAW CHAIN CO GRVL STNS 0011 GRVL CLAY 0013 GRVL STNS

- CONTINUED -

67- 561991 876 4821641	1060 01/54	2414	10	SU	140	19	50	190	8/00	IN	0015 WHIT LMSN 0030 BLCK LMSN 0068 GREY LMSN 0114 WHIT LMSN 0130 BILTMORE HAT COMPANY TPSL 0003 CLAY STNS 0019 BLCK LMSN 0081 GREY LMSN 0100 BLUE LMSN 0134 BRWN LMSN 0140 BLUE LMSN 0200 BLUE CLAY 0206 CITY OF GUELPH BLDR GRVL 0006 BLDR CLAY GRVL 0018 (S 0013 10) GRVL 0022 BLUE CLAY GRVL 0026 BLUE CLAY 0043 CLAY MSND 0063 CLAY GRVL 0071 GRVL 0075 (S 0071 05) GRVL CLAY 0081 GREY LMSN 0083 ONT AGRICULTURAL COL CLAY 0002 HPAN STNS 0010 CLAY BLDR 0022 HPAN 0042 LMSN 0095 GREY LMSN 0150 LMSN 0160 GREY SLTE 0170 GREY LMSN 0184 LMSN 0193 CORP CITY OF GUELPH BLCK MUCK 0004 CLAY STNS 0020 CLAY GRVL 0036 GRVL 0039 GREY LMSN 0068 BRWN LMSN 0110 BLCK LMSN 0130 GREY LMSN 0255 BLUE ROCK 0265 BLUE SHLE 0266 UNIVERSITY OF GUELPH MSND 0036 BRWN LMSN 0160 BLCK LMSN 0208 UNIVERSITY OF GUELPH TPSL 0001 BRWN CLAY STNS 0028 GREY CLAY STNS 0095 GREY CLAY SAND 0129 GREY ROCK 0230 MU CITY OF GUELPH BLDR CLAY 0012 BRWN SHLE 0040 BRWN ROCK 0092 GREY ROCK MUCK SOFT 0110 GREY ROCK HARD 0140 GREY ROCK SOFT 0170 GREY ROCK 0195 BLUE SHLE 0210 RAY REID CONSTR TPSL 0001 BRWN CLAY STNS 0032 GREY CLAY GRVL 0068 BRWN ROCK 0114 BRWN ROCK 0125 DE CORSO JAMES GRVL 0040 BRWN LMSN 0100 DIVJAK MIKE TPSL 0001 BRWN CLAY STNS 0022 GRVL SAND 0045 LMSN 0100 BRWN ROCK FCRD 0105
67- 562179 895 4821488	1052 07/63	2801		FR	18	14	16	60	4/00		
67- 562494 885 4820007	1100 01/58	2402	10	SU	190	50	98	164	48/00	PS	
67- 562996 936 4815977	1060 08/67	2406	12	FR FR	58 210	13	171	190	5/30	PS	
67- 563128 945 4820489	1100 12/67	2521	5	FR	208	25	40	25	3/00	PS	
67- 563280 4530 4820820	1090 01/73	2406	5	FR	155	65	85	25	2/00	DO	
67- 564000 6103 4823700	1075 05/76	1906	12	FR	50 100 108 138 165 125	7	81	800		MU	
67- 564350 5234 4818450	1125 08/74	2336	4	FR	125	36	70	6	1/00	DO	
67- 564900 3291 4817440	1090 06/68	2521	4	FR	100	9	15	15	2/00	DO	
67- 565100 6309 4816850	1085 09/76	1906	5		100	12	19	15	3/00	DO	

GUELPH CITY (GUELPH TWP)

67- 557105 883 4822998	1125 07/56	2414		FR	302	17	155	207	72/00	IN	CANADIAN GENERAL ELE PRDR 0177 GREY LMSN 0215 BRWN LMSN 0229 BLUE LMSN 0302 GREY LMSN 0323 IMPERIAL TOBACCO CO TPSL 0006 STNS GRVL CLAY 0015 CLAY STNS 0028 BRWN LMSN 0075 WHIT LMSN 0163 BLUE LMSN 0210 GREY LMSN 0260 BLUE LMSN 0308 BLUE SHLE 0310 COADY R RED CLAY 0017 BLUE CLAY BLDR 0020 YLLW LMSN 0044 WHIT LMSN 0072 GREY LMSN 0078 EMERGENCY MEASURES O GRVL 0086 GREY LMSN 0150 MITCHELL J CLAY STNS 0030 HPAN 0060 CLAY GRVL 0068 BRWN LMSN 0127
67- 557492 890 4823032	1125 11/59	2414	10	FR FR FR	85 196 210	12	146	150	25/00	IR	
67- 557742 851 4822973	1125 04/48	2414	6	FR	72	6	10		1/00	DO	
67- 558192 941 4823784	1120 11/67	2521	4	FR	150	38	60	10	2/00	DO	
DIV B 1 7 67- 556050 953 4819707	1125 10/56	2414	6	FR	100	40	60	7	6/00	ST DO	

MUNICIPALITY	UTM	CSG	KIND	WATER	STAT	PUMP	TEST	TEST	SCREEN	AUDIT_NO / TAG								
CONCESSION	WELL	EASTING	ELEV	DIA	OF	FOUND	LVL	LVL	RATE	TIME	WATER	DEPTH	LENGTH	DEPTHS	IN	FEET	TO	WHICH
ETC	LOT	NO	NORTHING	FEET	DATE	DRILLER	INS	WATER	FEET	FEET	FEET	GPM	HR:MN	USE	FEET	FEET	FORMATIONS	EXTEND
PUSLINCH TOWNSHIP																		
CON	04	021	67-	570740	1082	1988/04	4207	06	FR	0045	0003	0040	0100	1 :	DO		15715	/
			09268	4816060													GREY GRVL STNS 0025	GREY CLAY 0040 GREY GRVL 0045
CON	04	021	67-	565002	1110	1962/02	2414	04	FR	0215	0060	0115	0008	3 :0	ST DO			/
			02371	4813839													BLDR CLAY 0010 CLAY STNS 0045	GREY CLAY 0070 BRWN CLAY 0082 GREY CLAY 0100 STNS 0110 HPAN 0125 BRWN LMSN 0190 BLCK LMSN 0205 GREY LMSN 0230

TABLE

WATER WELL RECORDS

WELLS																		
TOTAL	ENDING IN		KIND OF WATER							WATER USE, ETC.								
WELLS	OVER-	BED-																
DRILLED	BURDEN	ROCK	FRESH	SALT	SULPH	MIN-	DRY	OR	IRRIG-	INDUS-	COMM-	MUNI-	PUBLIC	COOL/	NOT	TEST	ABAN-	
2	1	1	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	
- The location of these wells are either estimated from the centroid of the lot or they are uncertain																		



APPENDIX B

Site Photographs

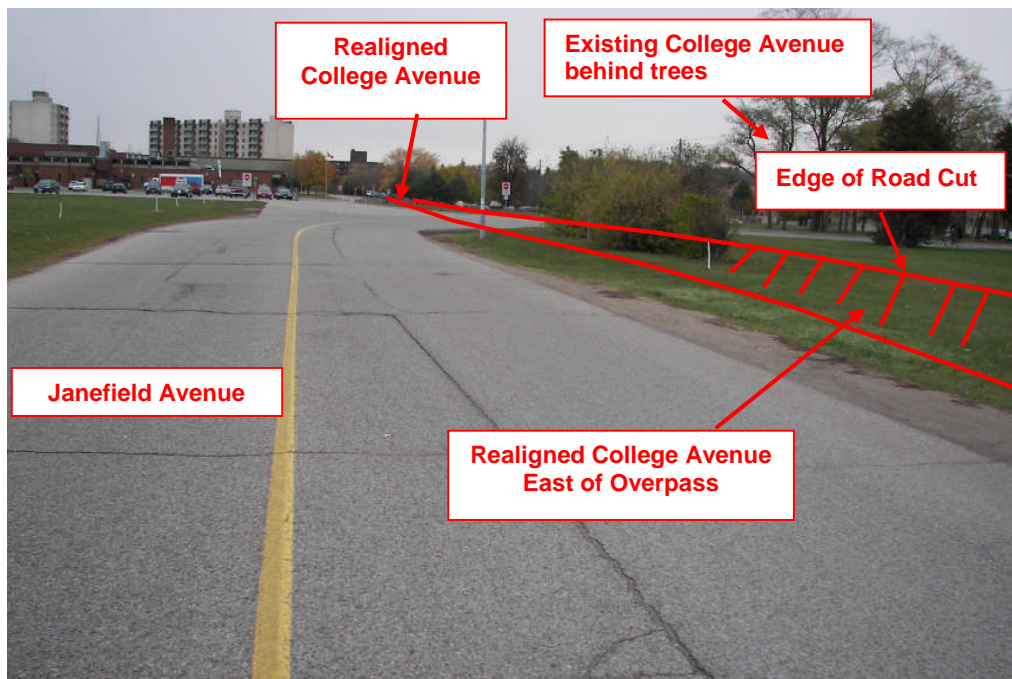
College Avenue – Photographs A-1 to A-4

Stone Road – Photographs B-1 to B-6

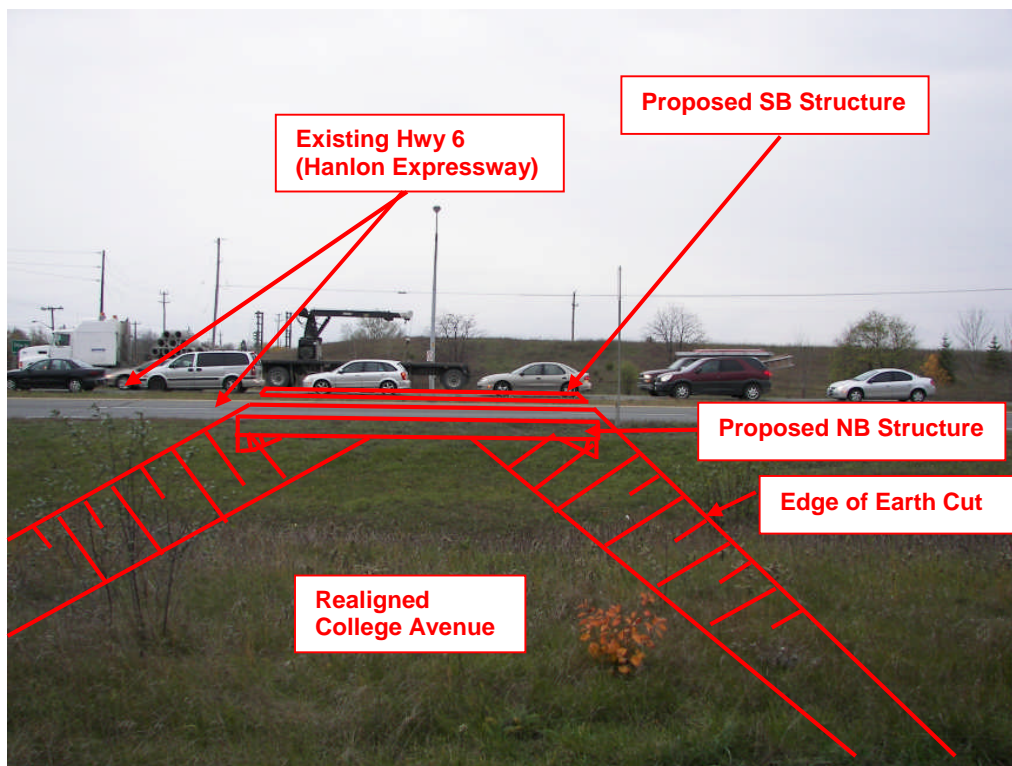
Kortright Road/Downey Road – Photographs C-1 to C-4

Laird Road – Photographs D-1 to D-4

COLLEGE AVENUE

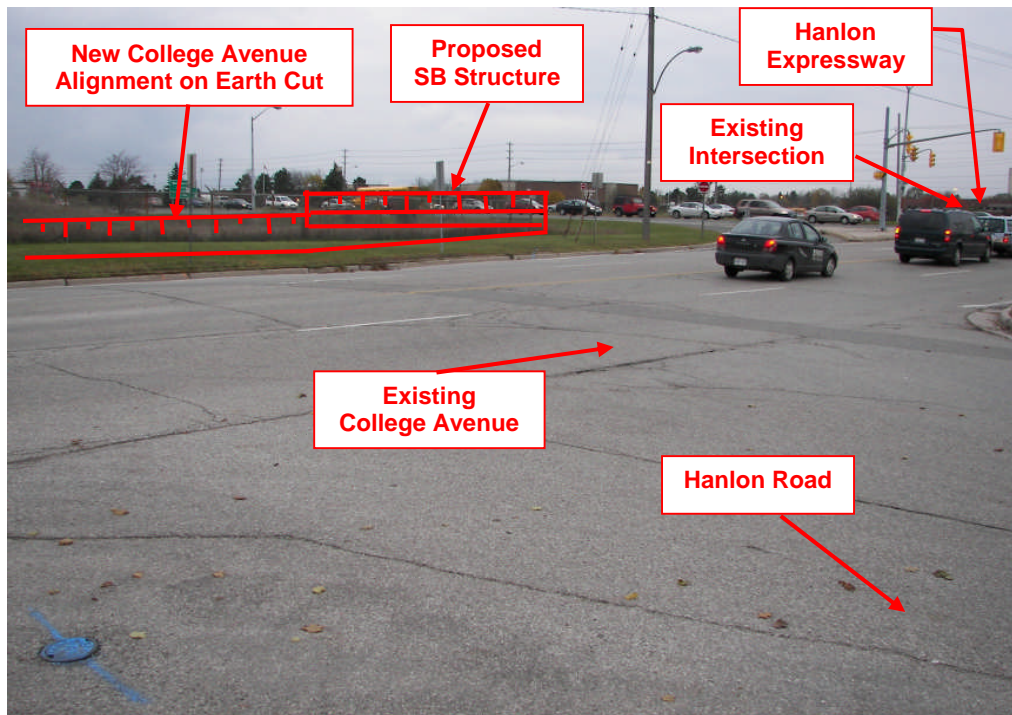


Photograph A-1: Viewing east from approximately 100 m east of Highway 6 (Hanlon Expressway) centreline median and 70 m north of College Avenue along new College Avenue alignment. (Nov. 15, 2007)



Photograph A-2: Viewing west from approximately 40 m east of Hanlon Expressway centreline median and 70 m north of College Avenue towards proposed overpass on the new College Avenue alignment. College Avenue will be constructed in an 8 m earth cut under Highway 6. (Nov. 15, 2007)

COLLEGE AVENUE



Photograph A-3: Viewing N-E from west corner of Hanlon Road and College Avenue intersection towards proposed overpass on the new College Avenue alignment. (Nov. 15, 2007)

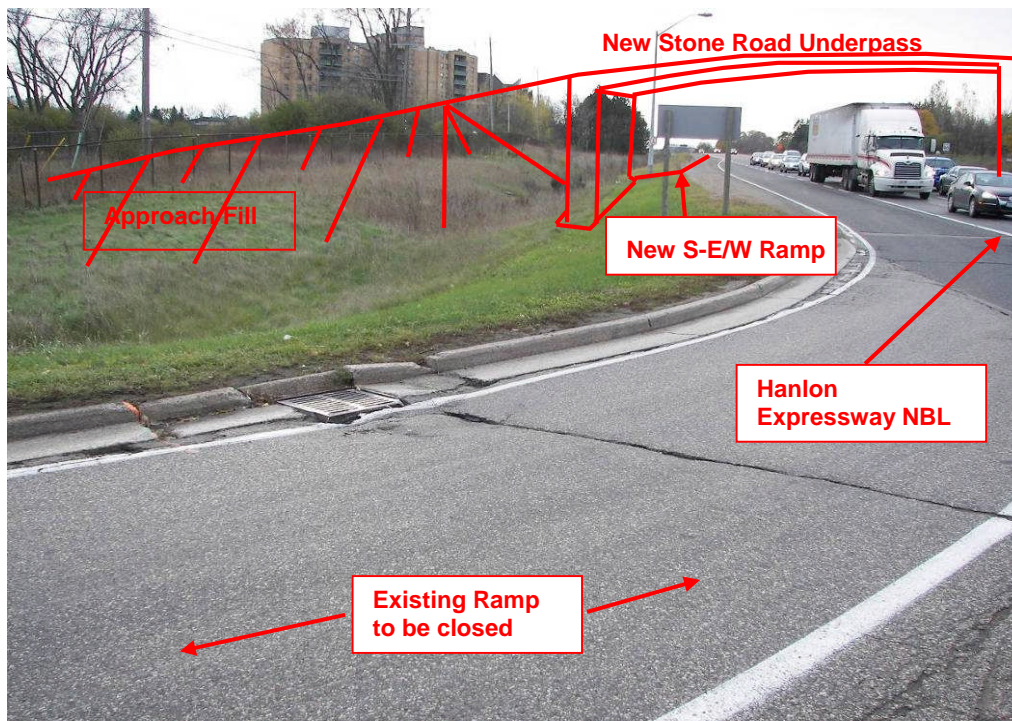


Photograph A-4: Viewing north from west corner of Hanlon Road and College Avenue intersection towards new College Avenue alignment. Note that high ground west of Hanlon Expressway will require earth cut. (Nov. 15, 2007)

STONE ROAD

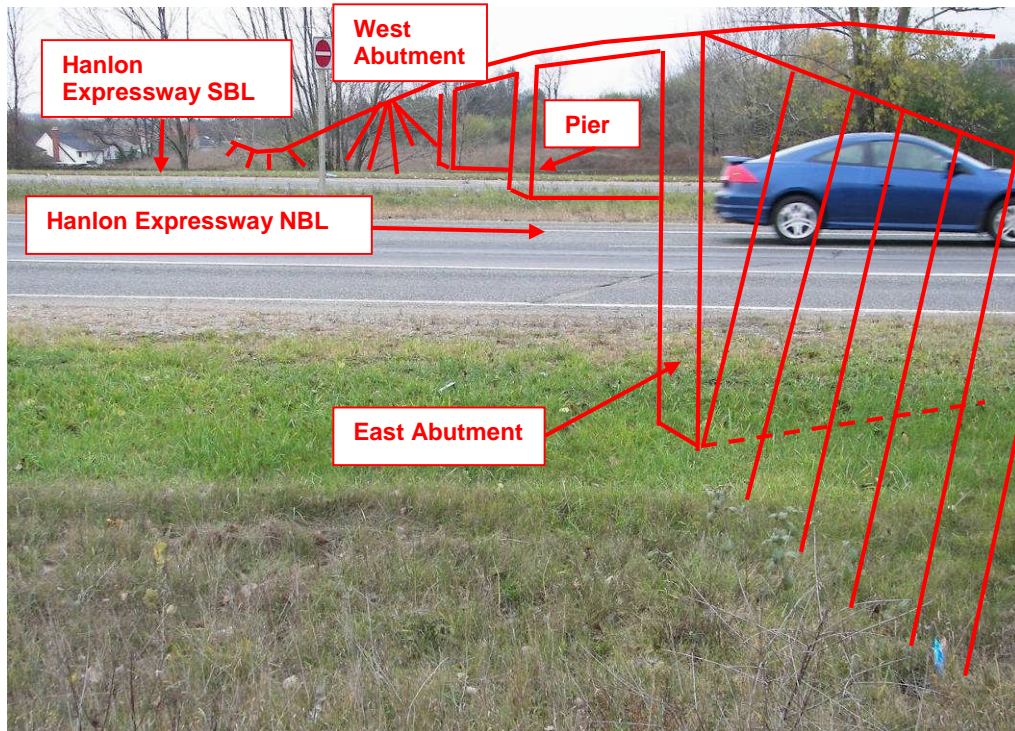


Photograph B-1: Viewing north along future W-N ramp from 20 m east of Hanlon Expressway centreline median and south of Stone Road. (Nov. 15, 2007)

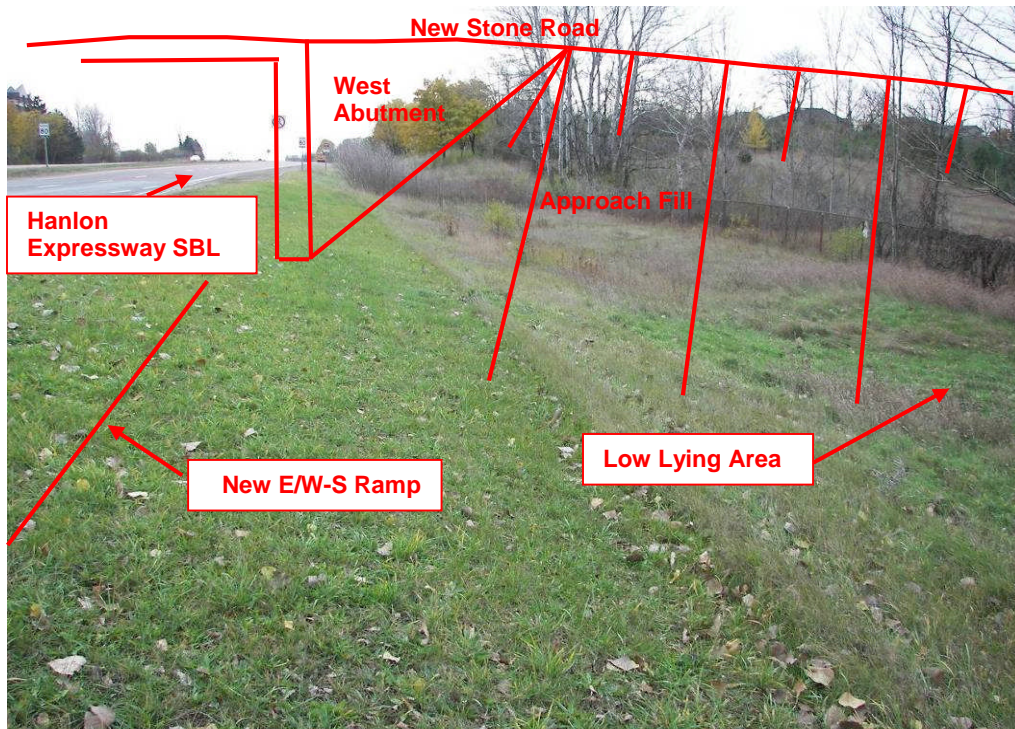


Photograph B-2: Viewing south from 20 m east of Hanlon Expressway centreline median and south side of Stone Road, at approximate location of the east abutment of the new Stone Road underpass. (Nov. 15, 2007)

STONE ROAD



Photograph B-3: Viewing west along future Stone Road underpass alignment, 20 m east of Hanlon Expressway centreline median and 40 m south of the existing Stone Road. (Nov. 15, 2007)



Photograph B-4: Viewing south from west of Hanlon Expressway, 10 m south of Stone Road at location of new Stone Road underpass. Realigned Stone Road will cross a low-lying area to the west of the bridge. (Nov. 15, 2007)

STONE ROAD

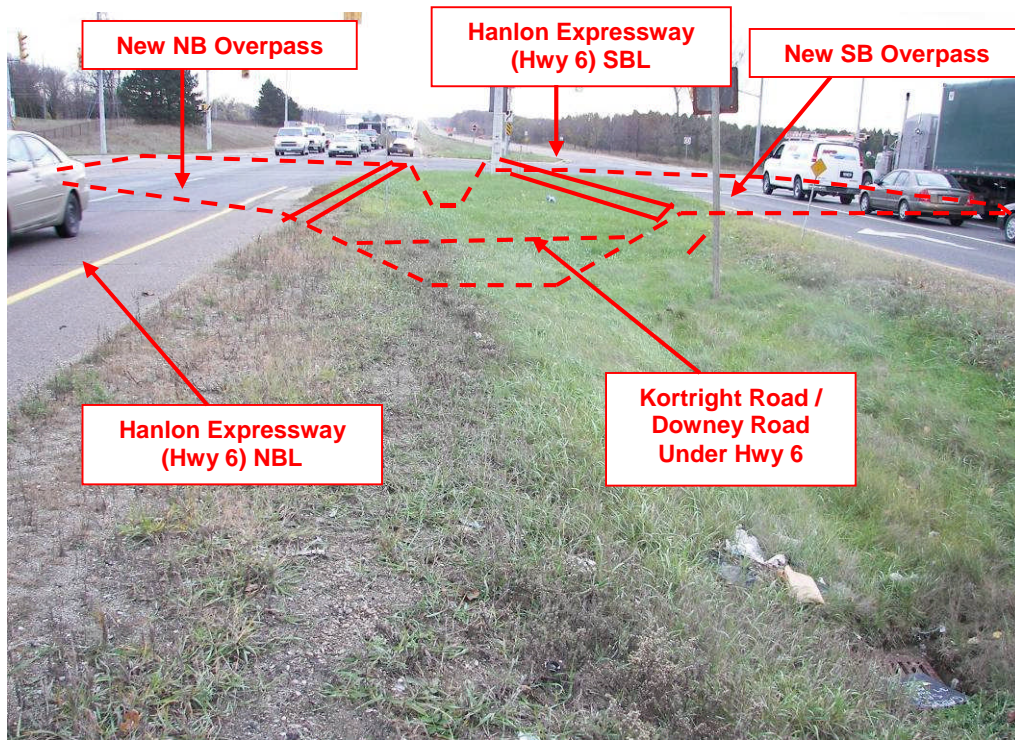


Photograph B-5: Viewing east from high ground on the north side of Stone Road. 150 m west of Hanlon Expressway and Stone Road intersection at new interchange. (Nov. 15, 2007)

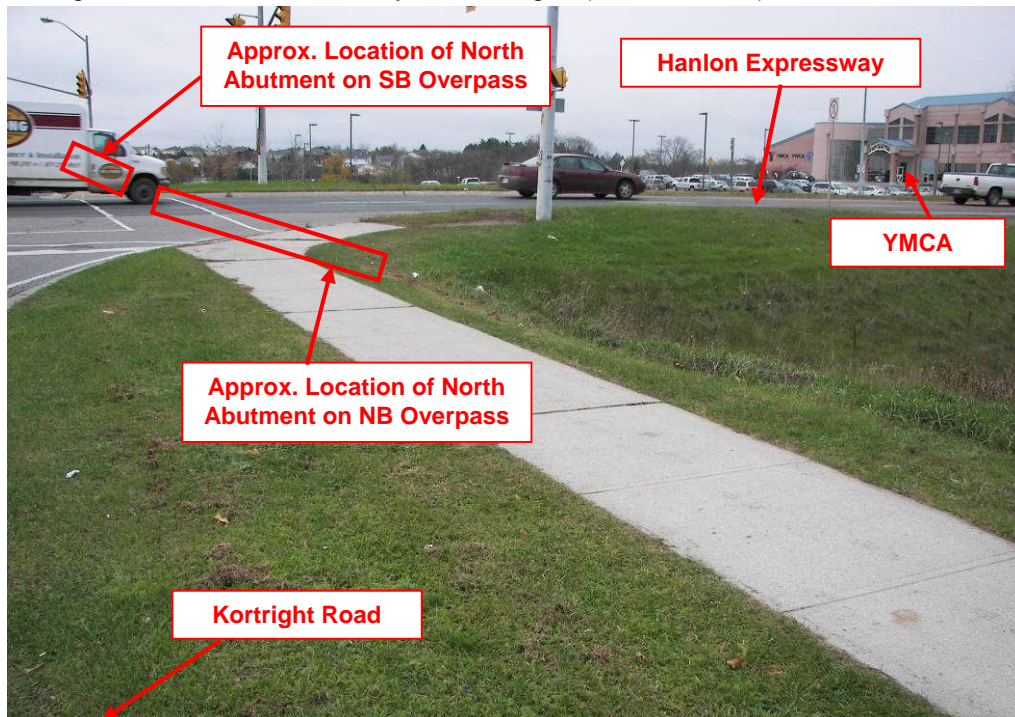


Photograph B-6: Viewing west along the south side ditch of Stone Road from approximately 90 m west of Highway 6 and Stone Road intersection. Looking as exposed native gravelly material, including cobbles, along the ditch. (Nov. 15, 2007)

KORTRIGHT ROAD/DOWNEY ROAD

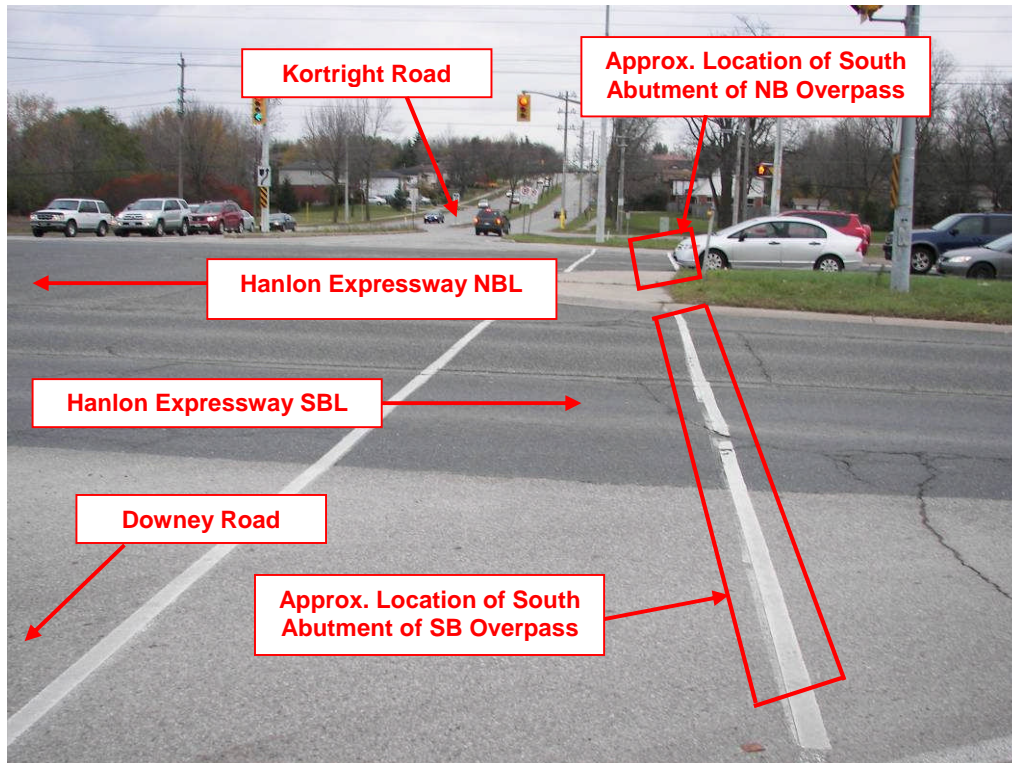


Photograph C-1: Viewing south along the centreline median of Highway 6 (Hanlon Expressway) at northbound (NB) and southbound (SB) overpasses of Kortright Road at left and Downey Road at right. (Nov. 15, 2007)



Photograph C-2: Viewing northwest at future north abutment location of northbound (NB) overpass approximately 40 m east of Highway 6 centreline median and 5 m north of Kortright Road centreline. (SB overpass behind truck in photograph). (Nov. 15, 2007)

KORTRIGHT ROAD/DOWNEY ROAD



Photograph C-3: Viewing east along existing Kortright Road/Downey Road from 20 m west of Highway 6 centreline median and south side of intersection. Proposed south abutment locations are shown on photograph. (Nov. 15, 2007)



Photograph C-4: Viewing south along proposed S-E/W and E/W-S ramps, from 20 m west of Highway 6 centreline median and 2 m south of Downey Road. Note typical low-lying terrain. (Nov. 15, 2007)

LAIRD ROAD

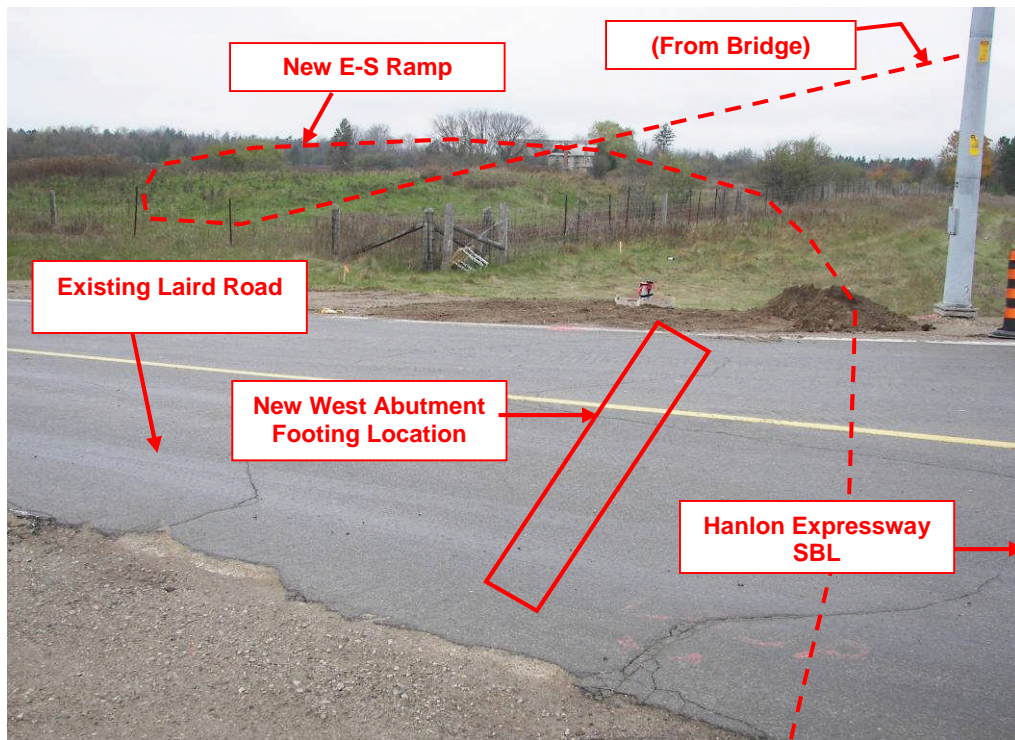


Photograph D-1: Viewing west from approximately 70 m east of Hanlon Expressway centreline median and north edge of Laird Road toward proposed Laird Road underpass alignment. (Nov. 15, 2007)

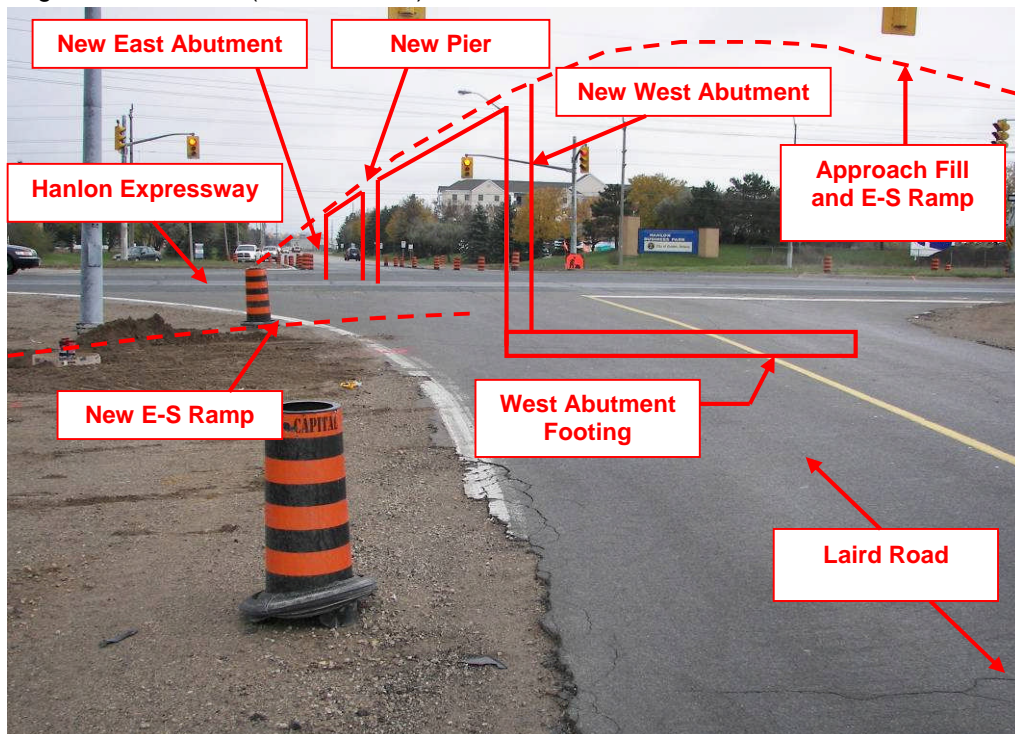


Photograph D-2: Viewing northeast towards new pier location and new E-N ramp alignment (in the distance) from southwest corner of Highway 6 and Laird Road intersection. (Nov. 15, 2007)

LAIRD ROAD



Photograph D-3: Viewing north towards west abutment location and new E-S ramp alignment from approximately 30 m west of Highway 6 centreline median and south edge of Laird Road. (Nov. 15, 2007)



Photograph D-4: Viewing east along Laird Road structure from approximately 40 m west of Hanlon Expressway centreline median and north edge of Laird Road. (Nov. 15, 2007)



APPENDIX C

Reference Subsurface Data

College Avenue

MTO GEOCRETS No. 40P9-20, W.P. No. 98-75-02

- Record of Boreholes 1 to 8
- Borehole Locations and Soil Strata Drawing No. 987502-A

Stone Road

PML Report Ref. 75F151 (Holiday Inn)

- Logs of Boreholes A to D and 1, 4 and 5
- Borehole Location Plan

PML Ref. 81F98 (Wood Glen Subdivision)

- Logs of Boreholes 1 to 6
- Table I - Piezometer Water Level Readings
- Borehole Location Plan

Kortright Road/Downey Road

PML Report Ref. 88F666 (Woodland Glen Subdivision)

- Logs of Boreholes 1 to 4
- Borehole Location Plan

PML Report Ref. 76F220 (Residential Subdivision)

- Logs of Test Pits 1, 3, 4, 5, 8, 10, 22, 27, 28, 40, 54 and 151
- Test Pit Location Plan

PML Report Ref. 76F148 (Hanlon Recharge Pond)

- Logs of Boreholes 1, 2 and 3
- Borehole Location Plan

City of Guelph No. 539 by Hydrology Consultants Ltd. Report No. 8295

- Logs of Boreholes 1/73 to 3/73, TH2/73 and TH3/73
- Borehole Location Plan

Laird Road

PML Report Ref. 86F16 (American Motors Satellite Plant)

- Logs of Boreholes 1 to 6
- Borehole Location Plan

PML Report Ref. 89F4 (Metalumen Manufacturing)

- Logs of Boreholes 1 to 6
- Borehole Location Plan

PML Report Ref. 99KF070 (Septic System)

- Logs of Test Pits 1, 2 and 3
- Test Pit Location Plan



COLLEGE AVENUE

RECORD OF BOREHOLE No 1

[illegible]

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 2

WP 98-75-02 LOCATION Sta. 98+87 o/s 25' Rt. College Ave. Revision
DIST 3 HWY 6N BORING DATE November 26, 1975 ORIGINATED BY PJS
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger COMPILED BY PJS
CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT —WL PLASTIC LIMIT —WP WATER CONTENT —w			UNIT WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	Wp	W	WL		
1072.3	Ground Level															
0.0	Sand and gravel		1	SS	54	1070										
	Compact to Very Dense		2	SS	34	1060										37 55 (8)
			3	SS	27											
			4	SS	40/6"											
1048.3			5	SS	55	1050										
24.0	Fine sand & silt, trace of clay.		6	SS	20											44 46 (10)
1042.3	Compact		7	SS	27											0 42 52 6
30.0	Clayey silt with sand, trace of gravel		8	SS	31	1040										
	(Glacial Till)		9	SS	100/7"											
	Hard		10	SS	100/8"	1030										
1021.8			11	SS	75/1"											
50.5	Limestone Bedrock		12	RC AXT	Rec 60%	1020										
1016.8																
55.5	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3

WP 98-75-02 LOCATION Sta. 99+28 o/s 20' Lt. College Ave. Revision
DIST 3 HWY 6N BORING DATE November 25, 1975 ORIGINATED BY PJS
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger COMPILED BY PJS
CHECKED BY *CP*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
1073.3	Ground Level															GR SA SI CL
0.0	Sand and Gravel		1	SS	20	1070						o				46 46 (8)
	Compact to Very Dense		2	SS	36	1060										
			3	SS	34											
			4	SS	95							o				39 51 (10)
1049.3	Fine sand with silt		5	SS	44	1050										
24.0			6	SS	34							o				0 71 28 1
	Dense		7	SS	32											
			8	SS	35							o				0 68 (32)
1040.3	Clayey silt with sand		9	SS	11	1040										
33.0	trace of gravel		10	SS	100/8"							o				9 38 (53)
	(Glacial Till)		11	SS	100/8"	1030						o				
	Stiff to Hard		12	SS	75/6"							o				
1020.2	End of Borehole															
53.1	Probable Bedrock															
	Note: Water Level not established															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 4

WP 98-75-02 LOCATION Sta. 99+93 o/s 38' Lt. & College Ave. Revision
DIST 3 HWY 6N BORING DATE December 1, 1975 ORIGINATED BY PJS
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger COMPILED BY PJS
CHECKED BY *CP*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_p	W	W_L		
1071.4	Ground Level															
0.0	Sand and Gravel					1070										
	Compact to Very Dense		1	SS	30	1060						0				9 86 (5)
			2	SS	40/5"											
			3	SS	40	1050										
			4	SS	34											
			5	SS	38											
1039.4			6	SS	63	1040						0				37 57 (6)
32.0	Clayey silt		7	SS	50											
1035.4	Very Stiff															
36.0	Sand and gravel		8	SS	50											
1031.4	Dense															
40.0	Clayey silt with sand					1030										
1027.9	Traces of gravel (Glacial Till) Hard		9	SS	100/7"							0.1				
43.5	End of Borehole															
	Note: Water Level not established.															

RECORD OF BOREHOLE NO 5

WP 98-75-02 LOCATION Sta. 99+97 o/s 36' Rt. College Ave. Revision
 DIST 3 HWY 6N BORING DATE November 28, 1975 ORIGINATED BY PJS
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger COMPILED BY PJS
 CHECKED BY *EPD*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
1071.8	Ground Level															
0.0																
	Sand and Gravel		1	SS	43	1070										
			2	SS	59	1060										
	Compact to Very Dense		3	SS	29											
			4	SS	47	1050										7 88 (5)
			5	SS	56											
			6	SS	44											38 57 (5)
			7	SS	38											
1040.8						1040										
31.0	Clayey silt		8	SS	18											
1036.8	Very Stiff															
35.0	Sand, some gravel		9	SS	32											
1031.8	Dense															
40.0	Clayey silt with sand, trace of gravel (Glacial Till)		10	SS	100/7"	1030										8 52 32 8
	Hard															
1019.3						1020										
52.5	End of Borehole Probable Bedrock															
	Note: Water Level not established.															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 6

WP 98-75-02 LOCATION Sta. 100+70 o/s 38' Rt. C College Ave. Revision
DIST 3 HWY 6N BORING DATE December 2, 1975 ORIGINATED BY PJS
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger COMPILED BY PJS
CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
1073.7	Ground Level															
0.0	Sand and Gravel					1070										
	Compact to Very Dense		1	SS	12	1060										
			2	SS	27											
			3	SS	43	1050										
			4	SS	58											
			5	SS	30											
			6	SS	42											
1040.7			7	SS	29	1040										
33.0	Clayey silt		8	SS	14											
	Very Stiff		9	SS	19											
1030.7						1030										
43.0	Fine sand															
1027.2	Very Dense		10	SS	78											
46.5	End of Borehole															

RECORD OF BOREHOLE NO 7

WP 98-75-02 LOCATION Sta. 101+15 o/s 35' Lt. College Ave. Revision ORIGINATED BY PJS
 DIST 3 HWY 6N BORING DATE December 3, 1975 COMPILED BY PJS
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger CHECKED BY

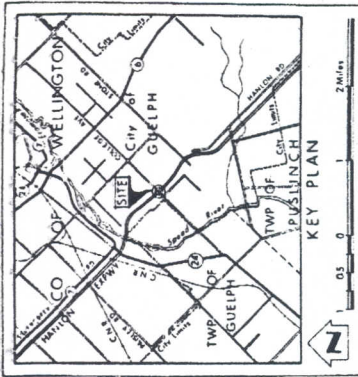
SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
1068.8	Ground Level															
0.0	Sand and Gravel		1	SS	25	1060										28 65 (7)
	Compact to Very Dense		2	SS	30											
			3	SS	51	1050										25 69 (6)
			4	SS	61											
			5	SS	36											
			6	SS	50											
			7	SS	32	1040										42 53 (5)
1036.8			8	SS	44											
32.0	Clayey silt		9	SS	15											
	Very Stiff		10	SS	14	1030										
1027.8																
41.0	Clayey silt with sand, trace of gravel		11	SS	16											
	(Glacial Till)		12	SS	97	1020										
	Stiff to Hard															
1014.7																
54.1	End of Borehole Probable Bedrock															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 8

WP 98-75-02 LOCATION Sta. 102+10 o/s 35' Rt. 6 College Ave. Revision ORIGINATED BY PJS
DIST 3 HWY 6N BORING DATE December 3, 1975 COMPILED BY PJS
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger CHECKED BY ep.

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
1067.9	Ground Level															
0.0	Sand and Gravel		1	SS	20	1060										
	Compact to Very Dense		2	SS	33											27 69 (4)
			3	SS	42	1050										
			4	SS	42											
			5	SS	55											34 60 (6)
			6	SS	28											
1036.9			7	SS	100	1040										
31.0	Clayey Silt		8	SS	18											
	Very Stiff		9	SS	19	1030										0 5 76 19
1026.9			10	SS	6											
41.0	Clayey silt with sand, trace of gravel (Glacial Till)		11	SS	30	1020										7 34 51 8
1014.4	Stiff to Hard															
53.5	End of Borehole Probable Bedrock															
	Note: Water Level not established.															



LEGEND

- Bore Hole
- Proposed Footings
- Water Level Established at Time of Field Investigation Nov & Dec 75

NO	ELEVATION	STATION	OFFSET
1	1072.1	97+81	30"IT
2	1072.3	98+87	25"BT
3	1072.3	99+28	20"IT
4	1071.4	99+03	38"IT
5	1071.8	99+07	36"BT
6	1072.7	100+70	38"BT
7	1068.8	101+15	35"IT
8	1067.9	102+10	35"BT

NOTE —
The boundaries between the sites have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geologic information.

NOTE FOR CONTRACT DOCUMENT
The structure may be examined in the Structural Office and Foundations Office, Department of the Registrar, and at the 311-11000, District Office.

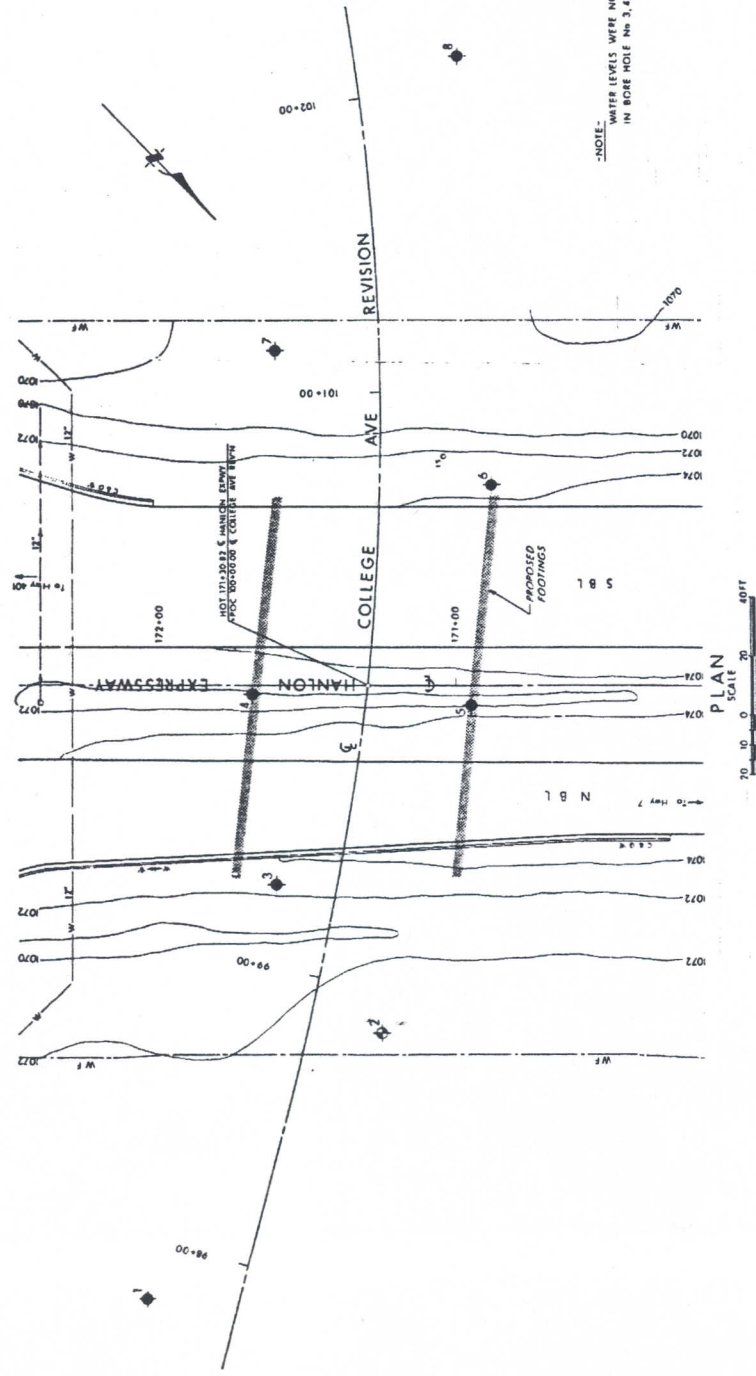
COLLEGE AVE REVISION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO
INCHING, JAMES BROWN, GEOTECHNICAL OFFICE - SIX MILE SECTION

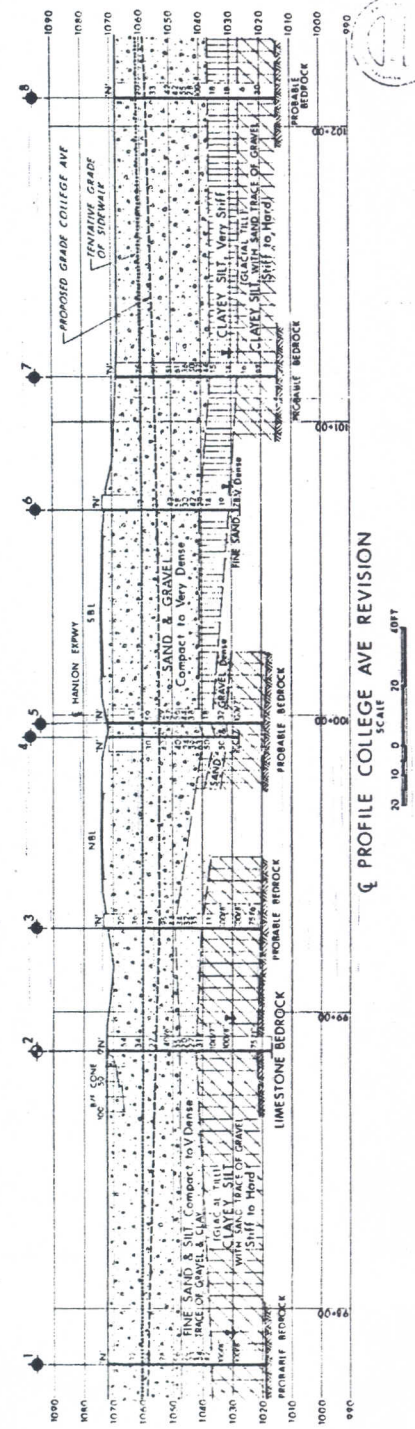
PROJECT NO. HANLON EXPWY DIST NO. 3
TWP. 10 W. WELLINGTON CO. OF GUELPH

BORE HOLE LOCATIONS & SOIL STRATA

BORE HOLE NO. 987502-A
DATE FOR 10, 1975
APPROVED: [Signature]
CONF. NO. 35-430



NOTE —
WATER LEVELS WERE NOT ESTABLISHED IN BORE HOLE NO. 3, 4, 5 & 8



PROFILE COLLEGE AVE REVISION



STONE ROAD



JOB NAME Holiday Inn
LOCATION Stone Road, Guelph
BORING METHOD 3" Solid Auger

JOB No. 75 F 151
BORING DATE Oct. 1, 1975
ENGINEER E.M.P.
TECHNICIAN H.K.

SOIL PROFILE				SAMPLES		SHEAR STRENGTH C_u	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P W W_L	GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE			
0'0"	GROUND ELEVATION: 75.3							
1'2"	TOPSOIL							"A"
5'0"	SAND/GRAVEL: Lt. brown gravelly fine to medium sand, dry, compact		70	1	SS	14		
	Borehole terminated at 6'0"			2	SS	23		Hole Dry
0'0"	BOREHOLE #B Elevation: 71.4 Ground Surface							
1'0"	TOPSOIL		70					"B"
2'0"	SILTY FINE SAND			1	SS	10		
5'6"	LOAM: Dk. brown sandy silt, few hair roots, loamy odour			2	SS	24		Hole dry
	SAND: Brown Becoming gravelly, moist		65			5'6"		
7'6"	Borehole terminated at 7'6"			3	SS	13		
0'0"	BOREHOLE "C" Elevation: 71.3 Ground Surface							
1'5"	TOPSOIL		70					"C"
5'6"	SAND: Lt. brown silty fine sand, dry, silt seams V. moist, silty layers little gravel cont.			1	SS	11		
	Borehole terminated at 5'6"			2	SS	20		Hole dry
0'0"	BOREHOLE "D" Elevation: 74.8 Ground Surface							
1'8"	TOPSOIL							"D"
5'6"	SAND/GRAVEL: Brown, gravelly fine to medium sand, dry, compact		70	1	SS	24		Hole dry
	Borehole terminated at 5'6"			2	SS	24		

NOTES:

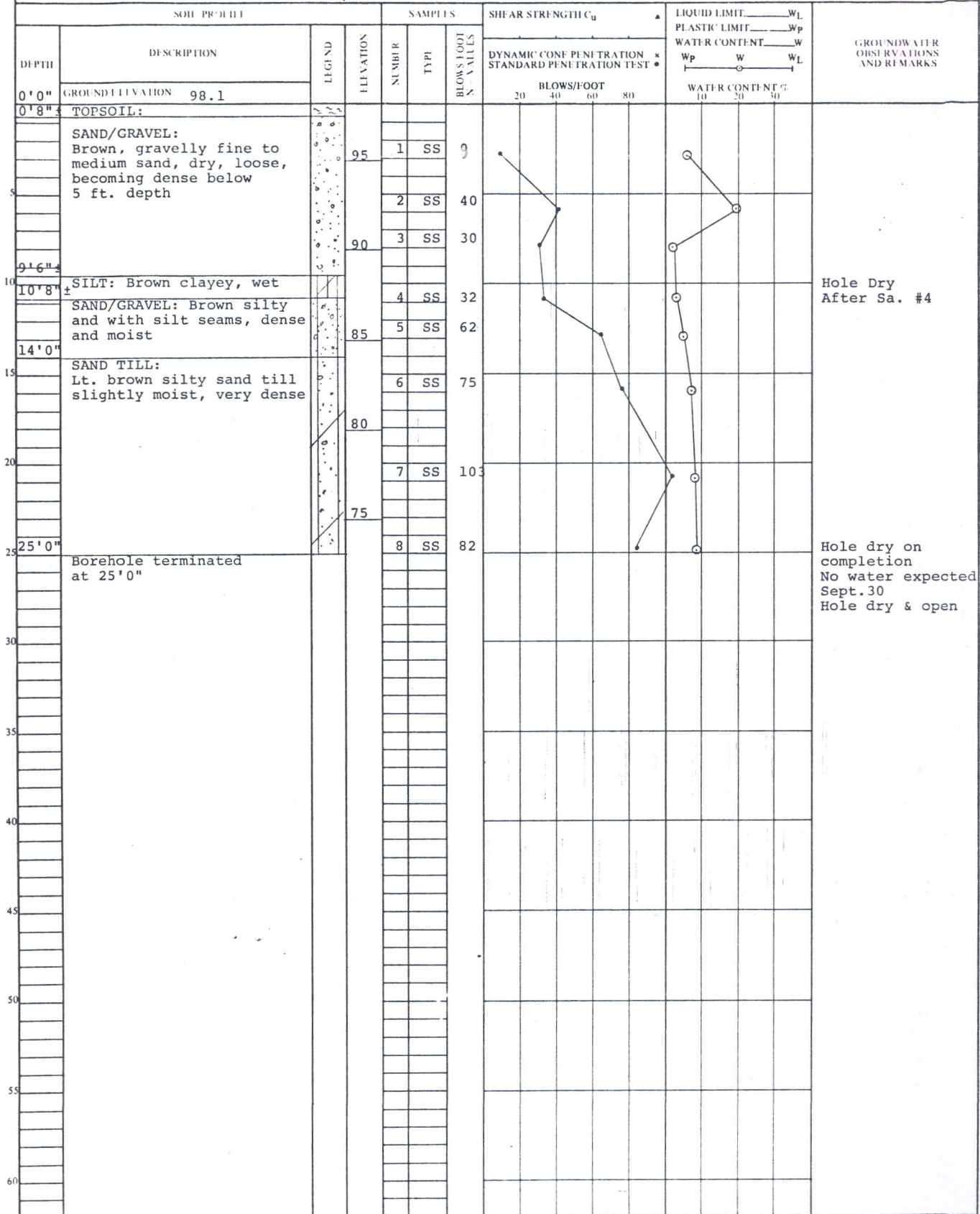
CHECKED BY

H.K.



JOB NAME Holiday Inn
LOCATION Stone Road, Guelph
BORING METHOD 3" Solid Auger

JOB No. 75 F 151
BORING DATE Sept. 29, 1975
ENGINEER E.M.P.
TECHNICIAN H.K.



NOTES:

CHECKED BY *KK*



JOB NAME: Holiday Inn
LOCATION: Stone Road, Guelph
BORING METHOD: 3" Solid Auger

JOB No. 75 F 151
BORING DATE: Sept. 30, 1975
ENGINEER: E.M.P.
TECHNICIAN: H.K.

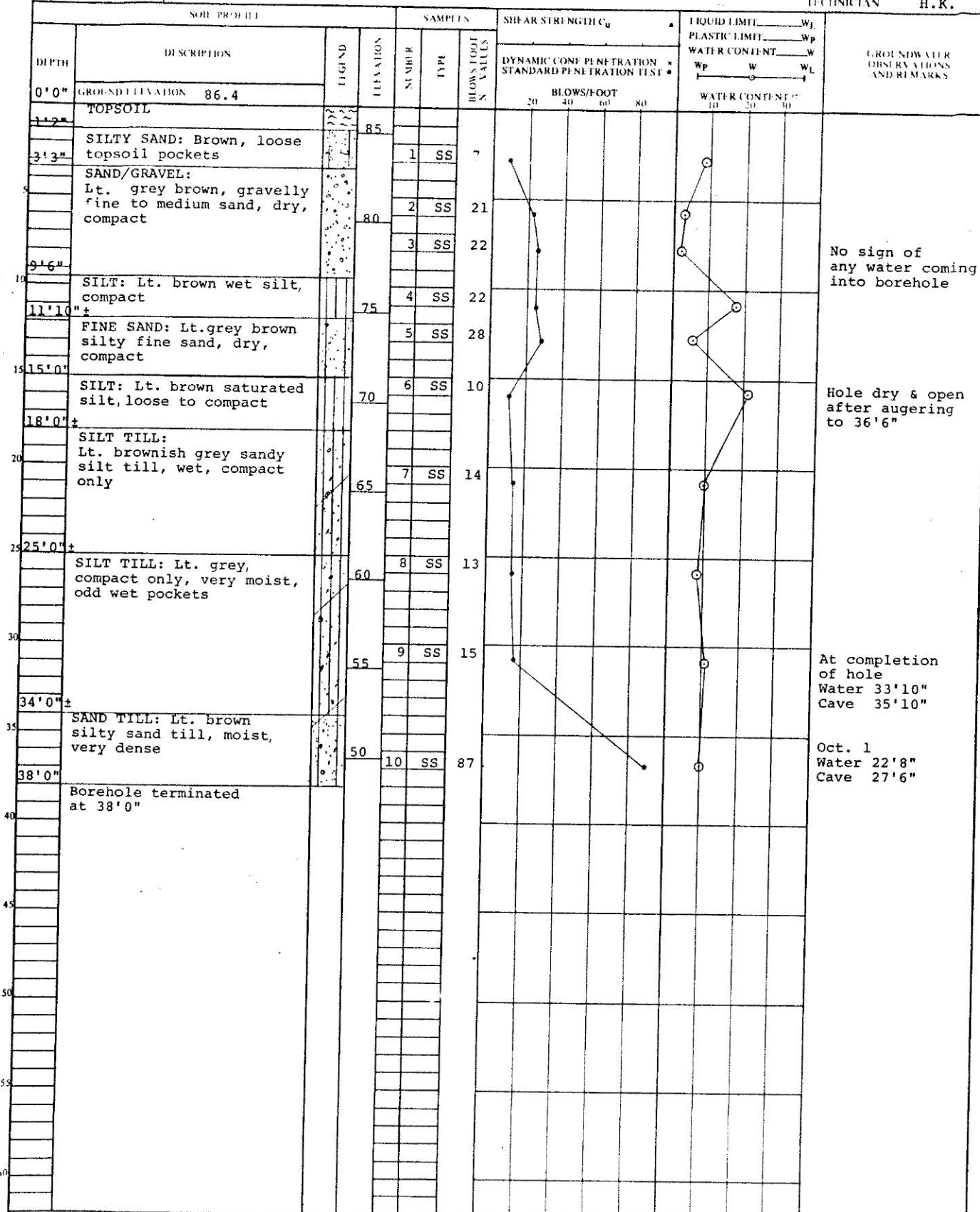
SOIL PROFILE			SAMPLES			SHEAR STRENGTH C_u		LIQUID LIMIT W_L		GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/FOOT N VALUES	DYNAMIC CONE PENETRATION * STANDARD PENETRATION TEST *	PLASTIC LIMIT W_p	WATER CONTENT W	
0'0"	GROUND ELEVATION: 89.2									
1'0"	TOPSOIL:									
	SAND/GRAVEL: Brown gravelly fine to medium sand, dry, compact		85	1	SS	13				
				2	SS	22				
				3	SS	20				
9'0"±	SAND/SILT: Lt. brown sandy silt with sand seams, quite moist, compact		80	4	SS	16				
13'0"±				5	SS	21				
14'0"	SAND/GRAVEL: Brown		75	6	SS	8				
	SILT: Lt. brown silt, saturated, loose, odd clayey seam			7	SS	57				
17'6"±	SAND/GRAVEL: Lt. brown/grey gravelly sand, dense, dry		70	8	SS	18*				
	Wet below 22'0"±		65							
26'6"	Borehole terminated at 26'6"									
*N value is believed to be low due to wet condition causing bottom disturbance before sampling.										

CHECKED BY: H.K.



JOB NAME Holiday Inn
LOCATION Stone Road, Guelph
BORING METHOD 3" Solid Auger

JOB No. 75 P 151
BORING DATE Sept. 30, 1975 ENGINEER E.M.P.
TECHNICIAN H.K.



NOTES

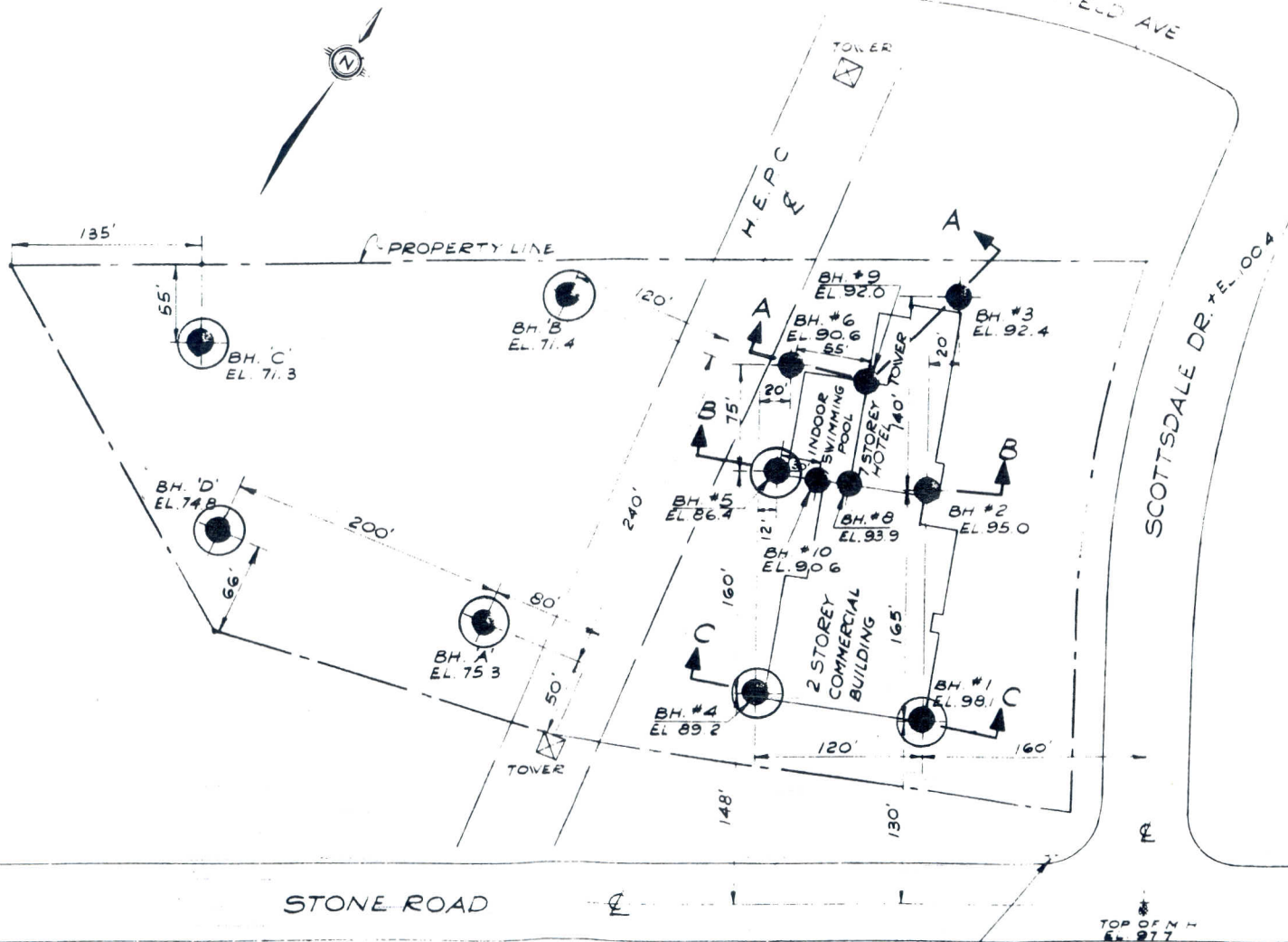
CHECKED BY *LL*

HANLON EXPRESSWAY

JANEFIELD AVE

SCOTTSDALE DR. *E.L. 100.4

STONE ROAD



SITE PLAN
SCALE 80' TO 1"



COMMONWEALTH HOLIDAY INNS OF CANADA LTD.			
HOLIDAY INN GUELPH/PORT			
PREPARED BY PETO MACCALLUM LTD.			
DRAWN BY X X	CHECKED BY T.M.	DATE OCT. 1975	JOB NO. T-155



PETO MACCALLUM LTD.
CONSULTING ENGINEERS

LOG OF BOREHOLE No. 1

JOB NAME PROPOSED WOOD GLEN SUBDIVISION, PHASE I

JOB No. 81 F 98

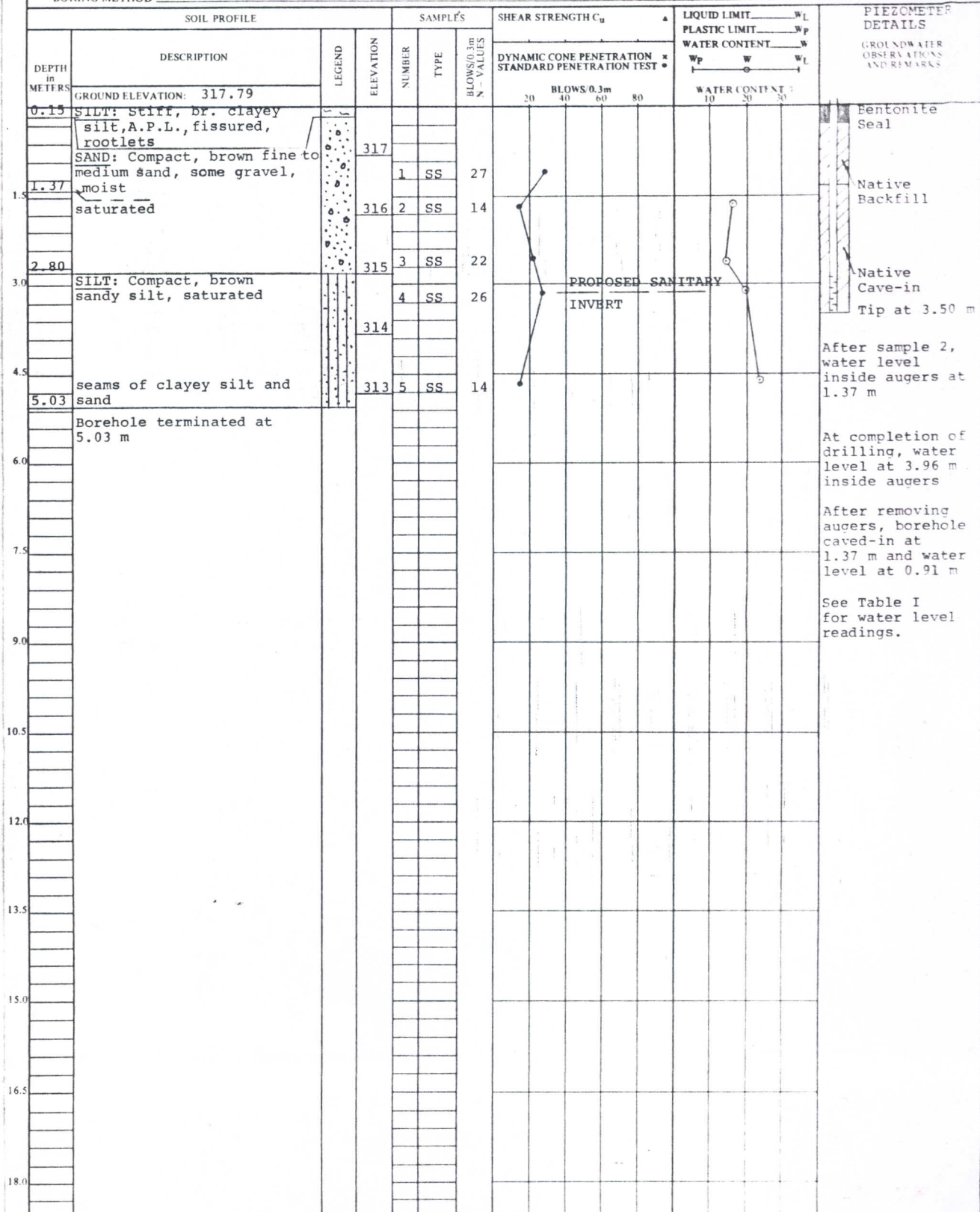
LOCATION STONE ROAD, GUELPH, ONTARIO

BORING DATE MAY 13, 1981

ENGINEER D.S.N.

BORING METHOD CONTINUOUS FLIGHT HOLLOW STEM AUGERS

TECHNICIAN D.S.N.



- NOTES
- 1) Bulk sample taken, 0.15 to 2.74 m
 - 2) Water sample taken from standpipe.





PETO MACCALLUM LTD.
CONSULTING ENGINEERS

LOG OF BOREHOLE No. 2

JOB NAME PROPOSED WOOD GLEN SUBDIVISION, PHASE I

JOB No. 81 F 98

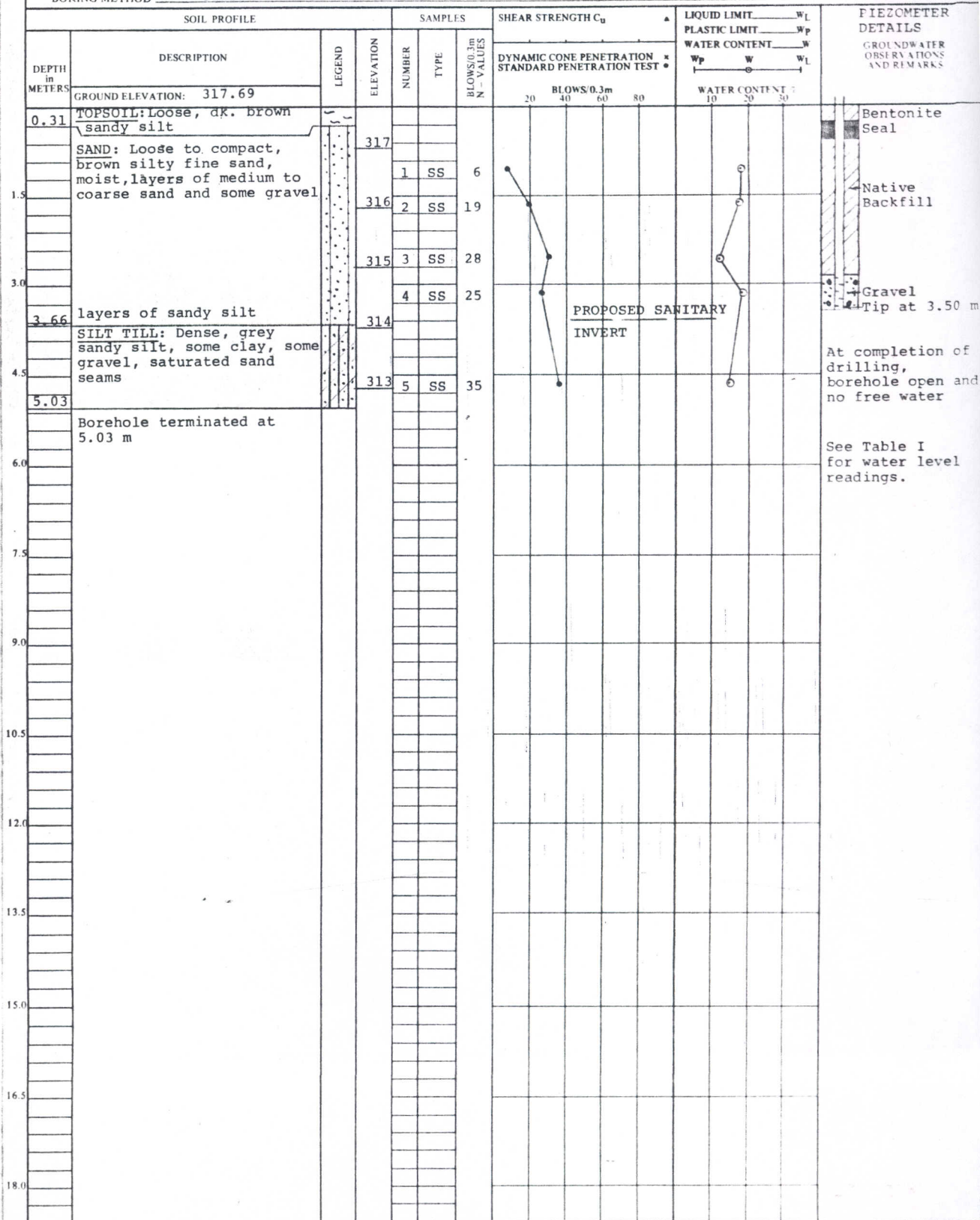
LOCATION STONE ROAD, GUELPH, ONTARIO

BORING DATE MAY 13, 1981

ENGINEER D.S.N.

BORING METHOD CONTINUOUS FLIGHT HOLLOW STEM AUGERS

TECHNICIAN D.S.N.



NOTES:





PETO MACCALLUM LTD.
CONSULTING ENGINEERS

LOG OF BOREHOLE No. 3

JOB NAME PROPOSED WOOD GLEN SUBDIVISION, PHASE I

JOB No. 81 F 98

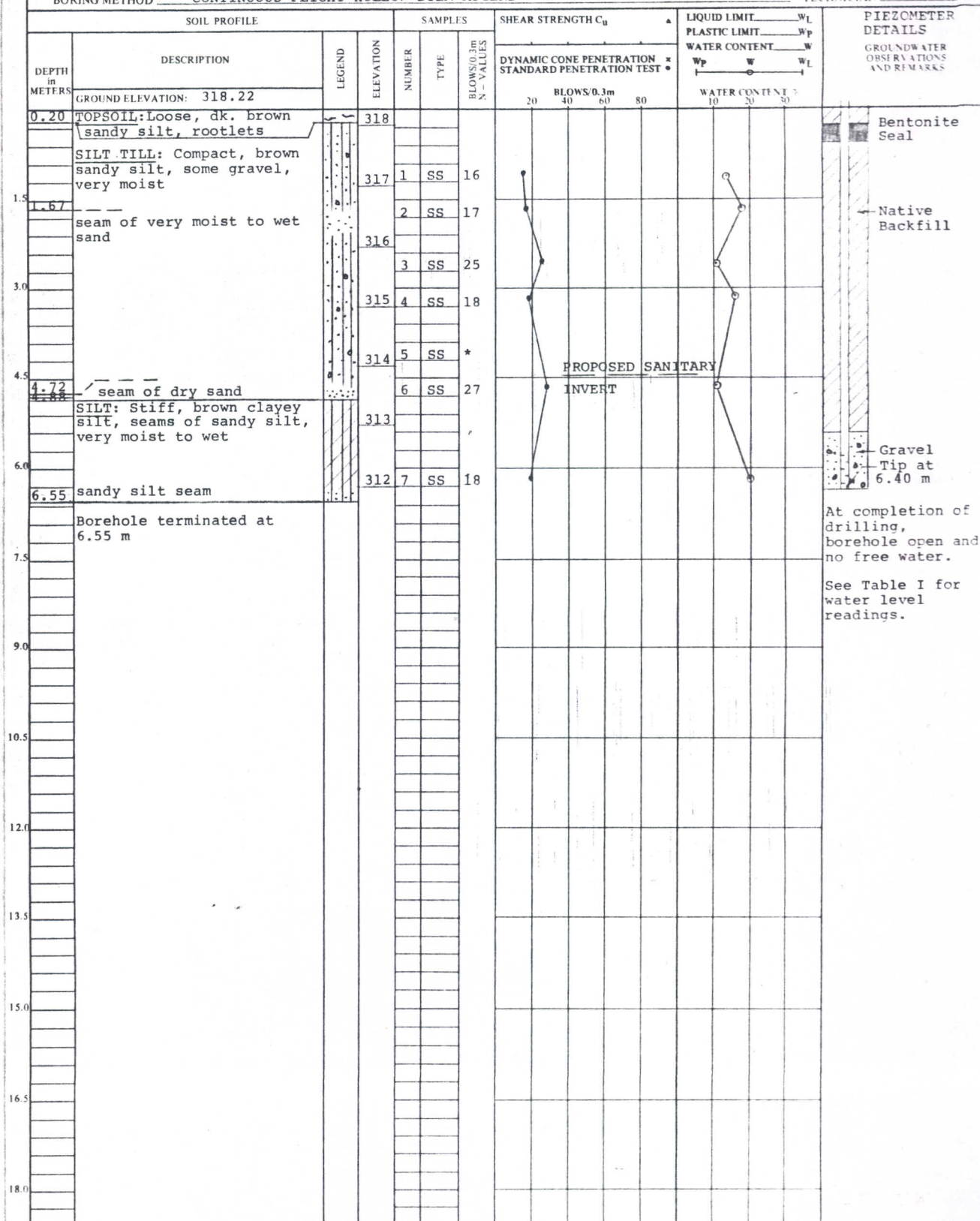
LOCATION STONE ROAD, GUELPH, ONTARIO

BORING DATE MAY 13, 1981

ENGINEER D.S.N.

BORING METHOD CONTINUOUS FLIGHT HOLLOW STEM AUGERS

TECHNICIAN D.S.N.



NOTES *Gravel affected "N" value.
1) Bulk sample taken, 1.52 to 4.57 m





PETO MACCALLUM LTD.
CONSULTING ENGINEERS

LOG OF BOREHOLE No. 4

JOB NAME PROPOSED WOOD GLEN SUBDIVISION, PHASE I

JOB No. 81 F 98

LOCATION STONE ROAD, GUELPH, ONTARIO

BORING DATE MAY 12, 1981

ENGINEER D.S.N.

BORING METHOD CONTINUOUS FLIGHT SOLID STEM AUGERS

TECHNICIAN D.S.N.

SOIL PROFILE			SAMPLES			SHEAR STRENGTH C_u		LIQUID LIMIT W_L		PIEZOMETER DETAILS	
DEPTH in METERS	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N-VALUES	DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST		PLASTIC LIMIT W_P		GROUNDWATER OBSERVATIONS AND REMARKS
							BLOWS/0.3m		WATER CONTENT W		
0.18	TOPSOIL: Loose, black silt, roots										<p>Bentonite Seal</p> <p>Native Backfill</p> <p>Gravel Tip at 3.35 m</p>
	SAND: Compact, brown silty fine sand, some gravel, moist		314	1	SS	23					
1.5			313	2	SS	17					
2.29											
2.89	compact, brown medium to coarse sand, some gravel		312	3	SS	12					
3.0	dense, brown coarse sand and gravel, dry			4	SS	56					
3.50	Borehole terminated at 3.50 m		311								At completion of drilling, borehole open and no free water See Table I for water level readings.
4.5											
6.0											
7.5											
9.0											
10.5											
12.0											
13.5											
15.0											
16.5											
18.0											

NOTES:

CHECKED BY DM





PETO MACCALLUM LTD.
CONSULTING ENGINEERS

LOG OF BOREHOLE No. 5

JOB NAME PROPOSED WOOD GLEN SUBDIVISION, PHASE I

JOB No. 81 F 98

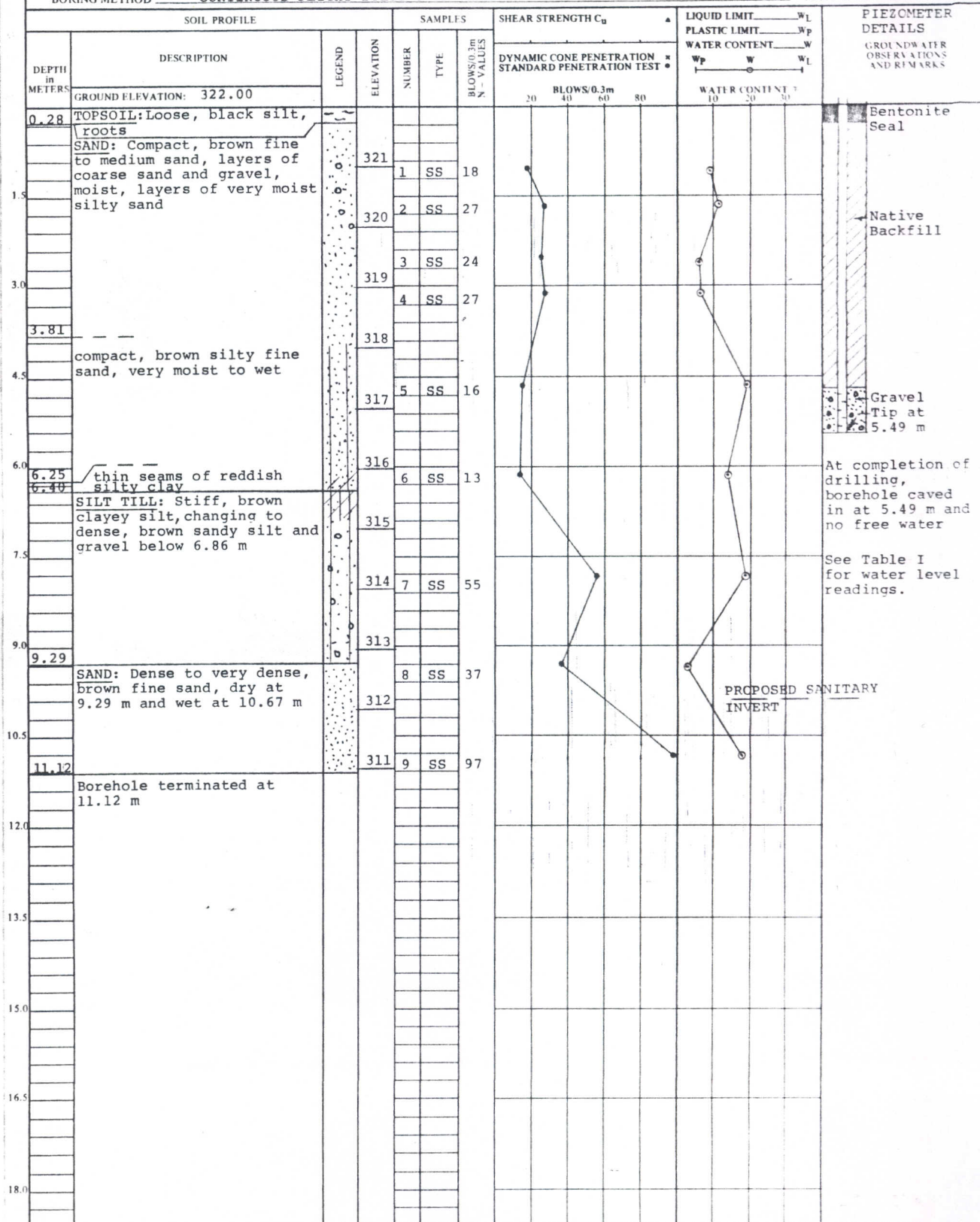
LOCATION STONE ROAD, GUELPH, ONTARIO

BORING DATE MAY 12, 1981

ENGINEER D.S.N.

BORING METHOD CONTINUOUS FLIGHT SOLID STEM AUGERS

TECHNICIAN D.S.N.

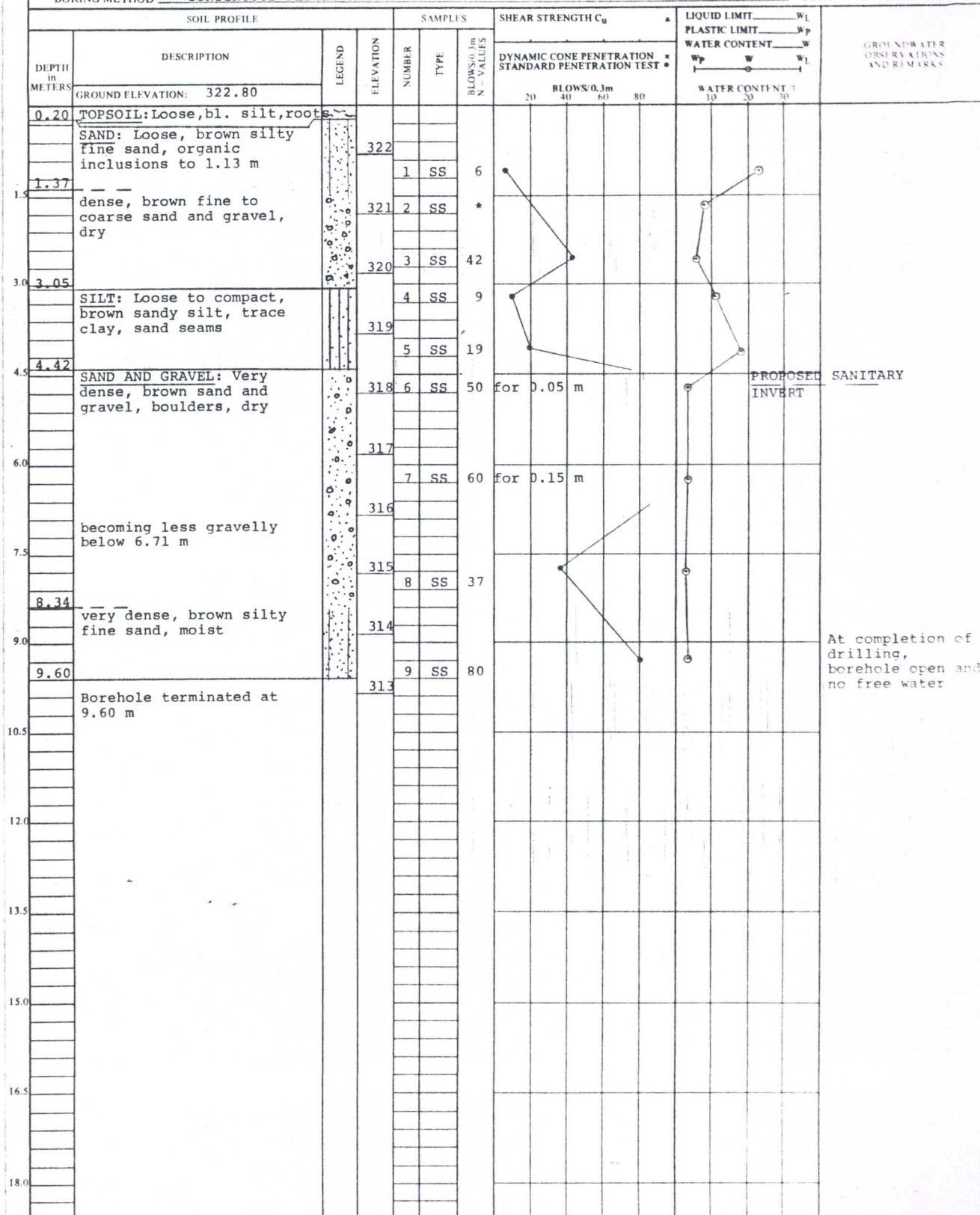


NOTES 1) Bulk sample taken, 1.52 to 4.57 m

JOB NAME PROPOSED WOOD GLEN SUBDIVISION, PHASE I

JOB No. 81 F 98

LOCATION STONE ROAD, GUELPH, ONTARIO

BORING DATE MAY 11 & 12/81 ENGINEER D.S.N.BORING METHOD CONTINUOUS FLIGHT HOLLOW AND SOLID STEM AUGERSTECHNICIAN D.S.N.

NOTES: *Gravel affected "N" values.

- 1) Borehole encountered practical refusal in sand and gravel with hollow stem augers and moved three times. Solid stem augers used to advance borehole.

TABLE 1

PIEZOMETER WATER LEVEL READINGS
WOOD GLEN SUBDIVISION
GUELPH, ONTARIO

PETO MACCALLUM LTD.
JOB NO. 81 F 98
MAY, 1981

Borehole No.	Depth to Tip of Piezometer (m)	May 15, 1981		May 19, 1981		May 21, 1981		May 25, 1981	
		Depth (m)	Elevation	Depth (m)	Elevation	Depth (m)	Elevation	Depth (m)	Elevation
1	3.50	0.91	316.88	-	-	1.01	316.78	-	-
2	3.50	No Water		-	-	No Water		No Water	
3	6.40	No Water		-	-	Piezometer Destroyed			
4	3.35	No Water		-	-	Piezometer Destroyed			
5	5.49	4.88	317.12	Piezometer Destroyed					

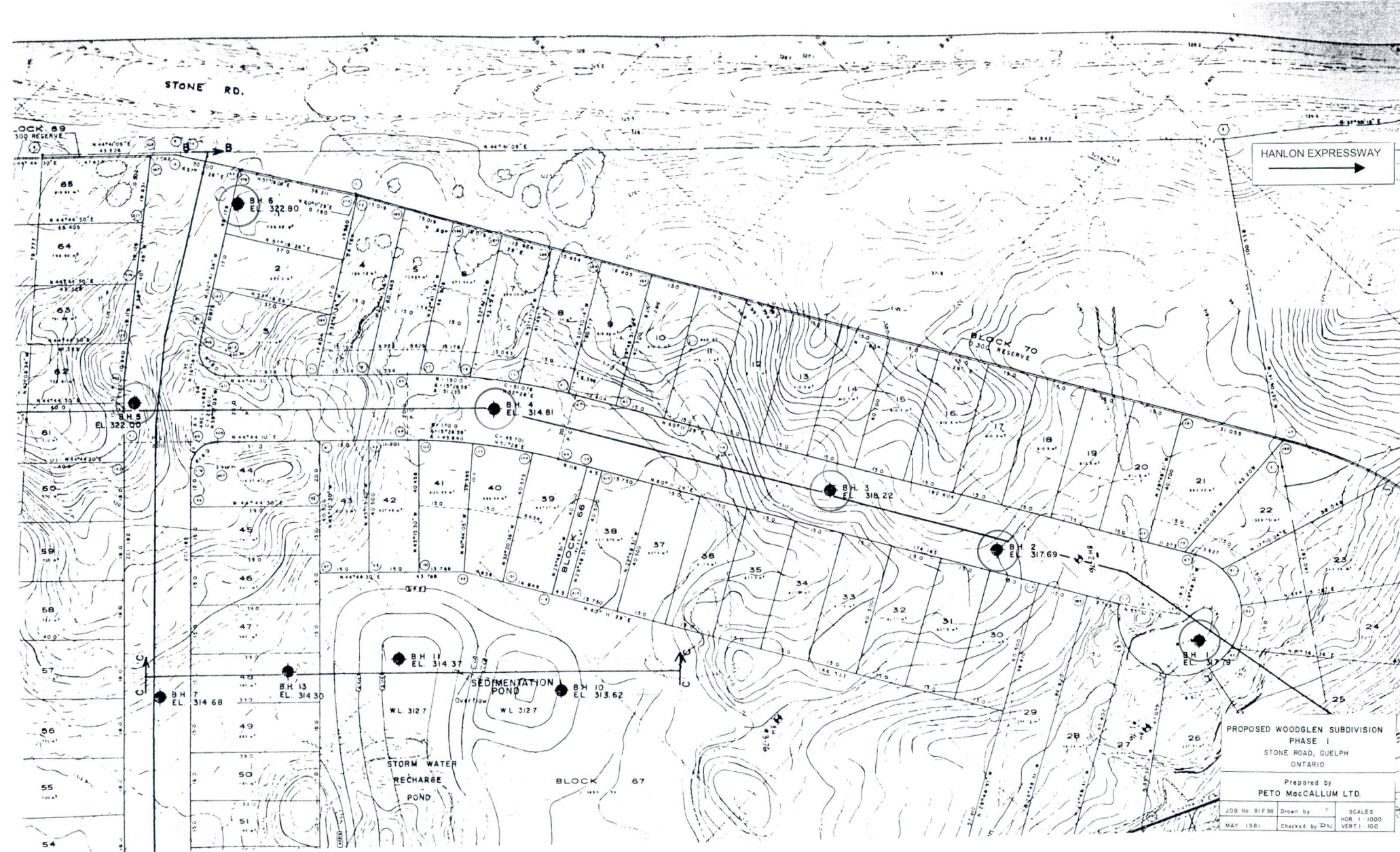
STONE RD.

HANLON EXPRESSWAY

PROPOSED WOODGLEN SUBDIVISION
PHASE I
STONE ROAD, GUELPH
ONTARIO

Prepared by
PETO MacCALLUM LTD.

JOB No. 81/F98 Drawn by [initials] SCALES
MAY 1981 Checked by [initials] HOR. 1:1000
VERT. 1:100





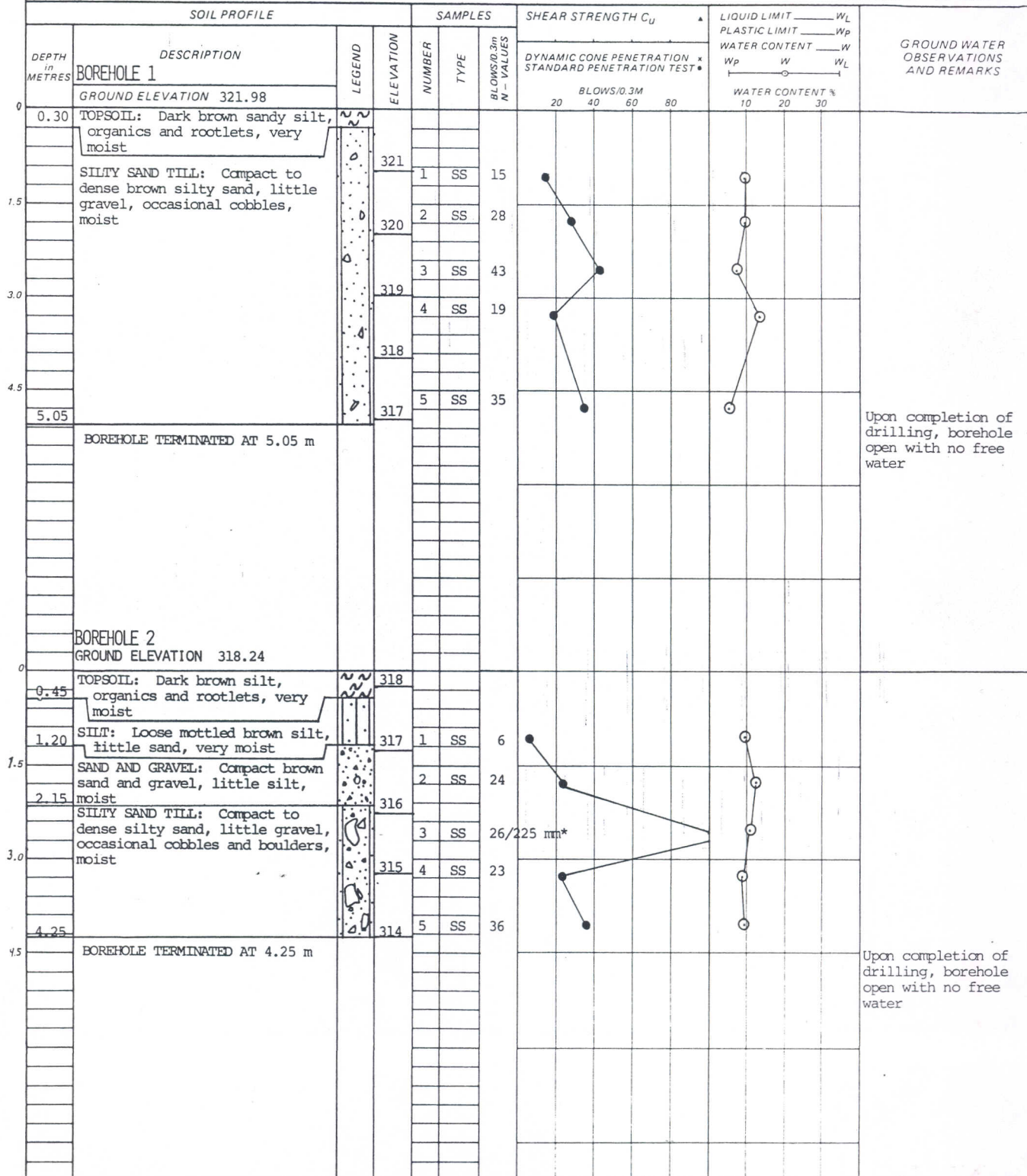
KORTRIGHT ROAD/DOWNEY ROAD

LOG OF BOREHOLE NO. 1 & 2

PROJECT PROPOSED RESIDENTIAL SUBDIVISION
LOCATION Woodland Glen Drive, Guelph, Ontario
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 1988 12 19

OUR PROJECT NO. 88 F 666
ENGINEER D. Kelly
TECHNICIAN D. Burt



NOTES: * Driving on cobbles

Bulk sample obtained from Borehole 1 from 3.00 to 4.50 m

CHECKED BY

LOG OF BOREHOLE NO. 3 & 4

PROJECT PROPOSED RESIDENTIAL SUBDIVISION

LOCATION Woodland Glen Drive, Guelph, Ontario

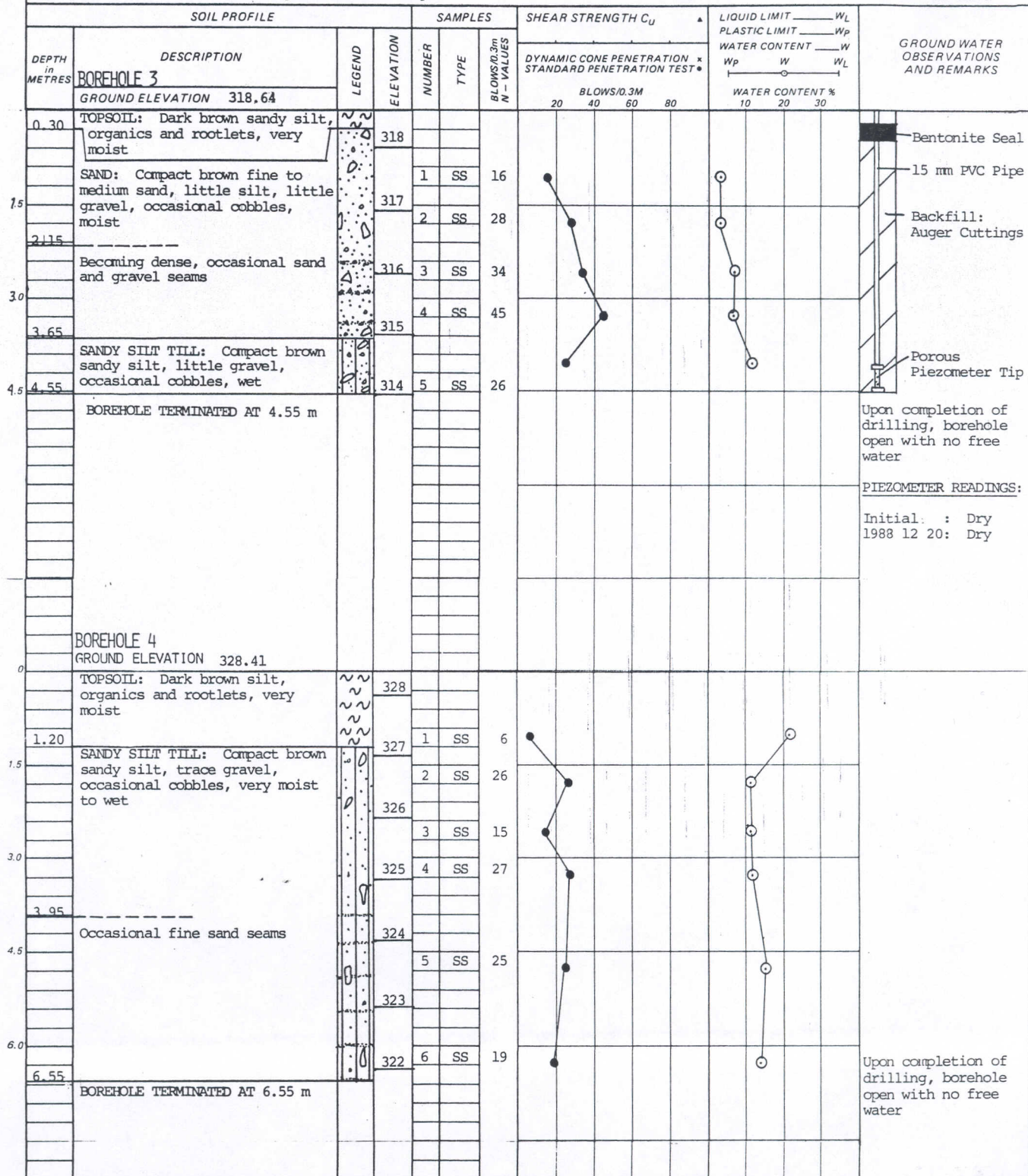
BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 1988 12 19

OUR PROJECT NO. 88 F 666

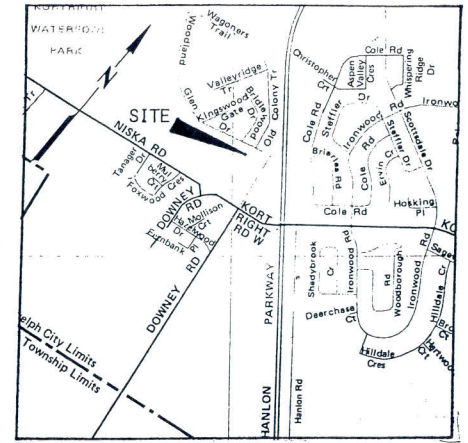
ENGINEER D. Kelly

TECHNICIAN D. Burt



NOTES: Bulk sample obtained from Borehole 4 from 3.00 to 4.50 m

CHECKED BY *DK*



KEY PLAN (N.T.S.)

LEGEND:

 BOREHOLE

REFERENCE:

SITE PLAN PREPARED BY BLACK, SHOEMAKER, ROBINSON & DONALDSON LIMITED, PROJECT NO. 83-351, DATED AUGUST 11, 1987.

NOTE:

THE INFERRED STRATIGRAPHY REFERRED TO IN THE REPORT IS BASED ON THE DATA FROM THESE BOREHOLES SUPPLEMENTED BY GEOLOGICAL EVIDENCE. THE ACTUAL STRATIGRAPHY BETWEEN THE BORINGS MAY VARY.

CITY OF GUELPH

PROPOSED RESIDENTIAL SUBDIVISION
WOODLAND GLEN DRIVE
GUELPH, ONTARIO

BOREHOLE LOCATION PLAN

PetoMacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	DLM	DATE	SCALE	JOB NO.	DRAWING NO.
CHECKED	<i>DR</i>	DEC. 1988	1 : 1250	88 F 666	1
APPROVED					



PETO MACCALLUM LTD.
CONSULTING GEOTECHNICAL ENGINEERS

LOG OF TEST PIT NO. 1, 2, & 3

JOB NAME PROPOSED SUBDIVISION

JOB No. 76F220

LOCATION Kortright and Downey Roads, Guelph

BORING DATE Sept 21, 1976

ENGINEER J.B.D.

BORING METHOD Backhoe

TECHNICIAN J.B.D.

SOIL PROFILE				SAMPLES			SHEAR STRENGTH C_u				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W				GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS FOOT N - VALUES	DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST				W_P	W	W_L		
							BLOWS/FOOT								
	GROUND ELEVATION: 1051.6						20	40	60	80	10	20	30		
0'4"	TOPSOIL: Black sandy silt		1050											M	
	SAND AND GRAVEL: Compact to dense medium to coarse sand and gravel, occasional cobbles and boulders below 5'6"		1045	1	C.S.										
			1040												
14'6"	Test Pit terminated 14'6".													Test Pit dry during excavation	
	Test Pit No. 2 2 Profile 3b Ground Elevations: 1037.6														
1'0"	TOPSOIL: Black sandy silt.		1035											M & H	
3'0"	SILTY SAND: Light brown silty fine sand to sandy silt		1	C.S.											
6'0"	SANDY TILL: Light brown silty fine sand, numerous cobbles and boulders														
	Test Pit terminated 6'0". Due to the large boulder content of fractured, weathered limestone.													Test Pit dry during excavation	
	Test Pit No. 3 Profile 1b Ground Elevation: 1034.7														
1'0"	TOPSOIL: Black sandy silt													M & H	
	SANDY TILL: Light brown silty fine sand to sand silt, some gravel, occasional cobbles and boulders		1030	1	C.S.										
5'0"	SAND AND GRAVEL: Dense to very dense medium to coarse sand and gravel, trace silt numerous cobbles and large boulders up 2'0" in diameter			2	C.S.										
			1025											M & H Ground water encountered 6'0".	
10'6"	Test Pit terminated at 10'6" due to large boulders.														

NOTES: M - Mechanical Sieve
H - Hydrometer

CHECKED BY BRC





PETO MACCALLUM LTD.
CONSULTING GEOTECHNICAL ENGINEERS

LOG OF TEST PIT NO. 4, 5, & 6

JOB NAME PROPOSED SUBDIVISION

JOB No. 76F220

LOCATION Kortright and Downey Roads, Guelph

BORING DATE Sept 21, 1976

ENGINEER J.B.D.

BORING METHOD Backhoe

TECHNICIAN J.B.D.

SOIL PROFILE				SAMPLES			SHEAR STRENGTH C_u				LIQUID LIMIT W_L				GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/FOOT N-VALUES	DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST				PLASTIC LIMIT W_P				
							BLOWS/FOOT				WATER CONTENT W				
							20	40	60	80	W_P	W	W_L	10	
Profile 1b (4)															
GROUND ELEVATION: 1035.7															
0	1'4"	TOPSOIL: Black sandy silt	1035											Ground water encountered 6'0". 	
		SANDY TILL: Light brown													
	3'0"	silty fine sand to sandy silt, some gravel													
		SAND AND GRAVEL: Dense brown													
5		medium to coarse sand and gravel, numerous cobbles and boulders	1030												
10			1025												
	12'0"	Test Pit terminated 12'0".													
15															
Test Pit No. 5															
Profile 1b															
Ground Elevation: 1037.9															
0	0'8"	TOPSOIL: Black sandy silt												Ground water encountered 7'6". 	
	2'0"	SILTY SAND: Light brown	1035												
		silty sand, some gravel													
		SAND AND GRAVEL: Dense													
5		light brown medium to coarse sand and gravel, numerous cobbles and boulders up to 2'0" in diameter	1030												
10															
	11'0"	CLAYEY SILT TILL: Grey	1025	1	C.S.										
	13'0"	clayey silt, some sand, trace to some fine gravel													
15		Test Pit terminated 13'0".													
Test Pit No. 6															
Profile 1b															
Ground Elevation: 1038.5															
0	1'0"	TOPSOIL: Black sandy silt												Ground water encountered 8'0". 	
		SANDY TILL: Compact light													
	4'0"	brown silty fine sand to sand silt, trace to some gravel	1035												
		SAND AND GRAVEL: Dense to													
5		very dense medium to coarse sand and gravel, numerous cobbles and boulders, occasional fractured lime- stone boulders below 8'0"	1030												
10															
	10'6"	Test Pit terminated 10'6" due to large boulders.													

NOTES:

CHECKED BY

BRG





PETO MACCALLUM LTD.
CONSULTING GEO-TECHNICAL ENGINEERS

LOG OF TEST PIT NO. 7, 8 & 9

JOB NAME PROPOSED SUBDIVISION

JOB No. 76F220

LOCATION Kortright and Downey Road, Guelph

BORING DATE Sept 21, 1976 ENGINEER J.B.D.

BORING METHOD Backhoe

TECHNICIAN J.B.D.

SOIL PROFILE				SAMPLES			SHEAR STRENGTH C_u				LIQUID LIMIT W_L				GROUNDWATER OBSERVATIONS AND REMARKS							
DEPTH	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/FOOT N - VALUES	DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST				PLASTIC LIMIT W_p											
							BLOWS/FOOT				WATER CONTENT %											
							20	40	60	80	W_p	W	W_L									
Profile 1b 7																						
GROUND ELEVATION 1036.7																						
0'10"	TOPSOIL: Black sandy silt		1035	1	C.S.									M & H								
2'6"	SANDY TILL: Light brown silty fine sand to sandy silt, some gravel																					
	SAND AND GRAVEL: Dense brown medium to coarse sand and gravel, some cobbles and boulders			2	C.S.																	
			1030											Ground water encountered 7'0".								
11'6"	Test Pit terminated 11'6".		1025											Ground water encountered 5'0".								
	Test Pit No. 8 Profile 3c Ground Elevation: 1035.4													Ground water encountered 7'6".								
1'0"	TOPSOIL: Black sandy silt		1030																			
2'0"	SILTY SAND: Reddish brown/brown silty sand, some gravel																					
	SAND AND GRAVEL: Dense brown medium to coarse sand and gravel, numerous cobbles and boulders																					
5'6"	CLAYEY SILT TILL: Hard, grey clayey silt, trace to some sand and fine gravel, occasional cobbles and boulders			1	C.S.									M & H								
11'0"	Test Pit terminated 11'0".		1025											Ground water encountered 7'6".								
	Test Pit No. 9 Profile 1c Ground Elevation: 1033.2													Ground water encountered 7'6".								
1'0"	TOPSOIL: Black silty		1030	1	C.S.																	
	SILTY SAND/SANDY SILT: Loose to compact grey silty fine sand to sandy silt, trace gravel with traces of organics																					
7'6"	SAND AND GRAVEL: Compact to dense medium to coarse sand some cobbles and boulders		1025											Ground water encountered 7'6".								
12'0"	Test Pit terminated 12'0"													Ground water encountered 7'6".								

NOTES:

CHECKED BY R.F.G.



JOB NAME PROPOSED SUBDIVISION

JOB No. 76F220

LOCATION Kortright and Downey Road, Guelph

BORING DATE Sept 22, 1976

ENGINEER J.B.D.

BORING METHOD

TECHNICIAN J.B.D.

SOIL PROFILE				SAMPLES			SHEAR STRENGTH C_u				LIQUID LIMIT W_L				GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/FOOT N-VALUES	DYNAMIC CONE PENETRATION * STANDARD PENETRATION TEST				WATER CONTENT				
							BLOWS/FOOT				WATER CONTENT %				
							20	40	60	80	Wp	W	WL	10	
0	Profile 1a. (22) GROUND ELEVATION: 1052.5														
0'6"	TOPSOIL: Balck sand silt		1050											M	
	SAND AND GRAVEL: Compact to			1 C.S.											
	dense fine to medium sand														
	and gravel, trace silt,														
5	becoming a medium to coarse		1045											Test Pit dry during excavation.	
	sand with some cobbles below														
	9'0"														
10			1040											Test Pit dry during excavation.	
13'0"	Test Pit terminated 13'0".														
	Test Pit No. 23 Profile 1a Ground Elevation: 1058.2														
0	TOPSOIL: Black sandy silt		1055												
0'10"	SAND AND GRAVEL: Dense to														
	very dense brown fine to			1050											
	medium sand and gravel														
5			1045											Test Pit dry during excavation.	
10														Test Pit dry during excavation.	
14'0"	Test Pit terminated 14'0".														
	Test Pit No. 24 Profile 1a Ground Elevation: 1063.8														
0	TOPSOIL: Black sandy silt		1060											M	
1'0"	SAND AND GRAVEL: Dense to			1 C.S.											
	very dense fine to medium														
	sand and gravel, numerous														
5	cobbles and boulders below		1055											Test Pit dry during excavation.	
	8'0"														
			1050												
10														Test Pit dry during excavation.	
14'0"	Test Pit terminated 14'0".														

NOTES:

CHECKED BY B.R.G.



PETO MACCALLUM LTD.
CONSULTING GEOTECHNICAL ENGINEERS

LOG OF TEST PIT NO. 27, 28 & 29

JOB NAME: PROPOSED SUBDIVISION

JOB No. 76P220

LOCATION: Kortright and Downey Roads, Guelph

BORING DATE: Sept. 23, 1976

ENGINEER: J.B.D.

BORING METHOD: Backhoe

TECHNICIAN: J.B.D.

SOIL PROFILE			SAMPLES		SHEAR STRENGTH C_u				LIQUID LIMIT W_L			GROUNDWATER OBSERVATIONS AND REMARKS		
DEPTH	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/FOOT N-VALUES	DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST				PLASTIC LIMIT W_p			
							BLOWS/FOOT				WATER CONTENT %			
							20	40	60	80	W_p		W	W_L
Profile 3a (27)														
GROUND ELEVATION: 1056.4														
0	1'0"	TOPSOIL: Black sandy silt	1055									Test Pit dry during excavation.		
		SANDY TILL: Compact light brown silty fine sand to sandy silt, some cobbles and boulders												
			1050											
			1045											
15	14'0"	Test Pit terminated 14'0".												
Test Pit No. 28 Profile 3a Ground Elevation: 1046.4														
0	1'0"	TOPSOIL: Black, sandy silt	1045									Test Pit dry during excavation.		
		SANDY TILL: Compact to dense light brown silty fine sand to sandy silt, trace to some gravel, occasional cobbles and boulders												
			1040											
			1035											
12'0"		Test Pit terminated 12'0", due to large fragments of fractured limestone boulders												
Test Pit No. 29 Profile 1b Ground Elevation: 1064.0														
0	1'0"	TOPSOIL: Black sandy silt	1060									Test Pit dry during excavation.		
		SANDY TILL: Compact light brown silty fine sand to sandy silt, trace gravel												
			1055											
			1050											
14'0"		Test Pit terminated 14'0".												
NOTES:														
CHECKED BY: BPG														



PETO MACCALLUM LTD.
CONSULTING GEOTECHNICAL ENGINEERS

LOG OF TEST PIT NO. 40, 41 & 42

JOB NAME PROPOSED SUBDIVISION

JOB No. 76F220

LOCATION Kortright and Downey Roads, Guelph

BORING DATE Sept 24, 1976

ENGINEER J.B.D.

BORING METHOD Backhoe

TECHNICIAN J.B.D.

SOIL PROFILE			SAMPLES			SHEAR STRENGTH C_u				LIQUID LIMIT W_L			GROUNDWATER OBSERVATIONS AND REMARKS	
DEPTH	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/FOOT N-VALUES	DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST				PLASTIC LIMIT W_P			
							WATER CONTENT W				WATER CONTENT %			
							BLOWS/FOOT				10 20 30			
	Profile 1b GROUND ELEVATION: 1084.5						20	40	60	80				
1'0"	TOPSOIL:													
	SILTY SAND: Light brown silty fine sand													
2'6"	SAND AND GRAVEL: Dense to very dense medium to coarse sand and gravel, some cobbles and boulders up to 15" in diameter		1080	1	C.S.									M
			1075											
			1070											
15'0"	Test Pit terminated 15'0"													Test Pit dry during excavation.
	Test Pit No. 41 Profile 3b Ground Elevation: 1056.2													
1'2"	TOPSOIL: Black silty		1055											
	SAND AND GRAVEL: Compact fine to medium sand gravel, some cobbles and boulders													
3'6"	SANDY TILL: Compact to dense light brown silty fine sand to sand silt, some fine gravel occasional cobbles and boulders		1050	1	C.S.									M & H
			1045											
12'6"	Test Pit terminated 12'6".													Test Pit dry during excavation.
	Test Pit No. 42 Profile 3b. 42 Ground Elevation: 1056.6													
1'0"	TOPSOIL: Black sandy silt		1055											
	SILTY SAND: Reddish brown silty fine sand													
2'6"	SANDY TILL: Compact to dense light brown silty fine sand to sandy silt, trace to some gravel occasional cobbles and boulders		1050											
			1045											
12'6"	Test Pit terminated 12'6".													Test Pit dry during excavation.

NOTES:

CHECKED BY BFG



JOB NAME _____ PROPOSED SUBDIVISION _____

JOB No 76F220

LOCATION Kortright and Downey Roads, Guelph

BORING DATE Sept 24, 1976 ENGINEER J.B.D.

BORING METHOD _____ Backhoe

TECHNICIAN J.B.D.

SOIL PROFILE				SAMPLES		SHEAR STRENGTH C_u				LIQUID LIMIT W_L			GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST				PLASTIC LIMIT W_P			
						BLOWS/FOOT				WATER CONTENT W			
						20	40	60	80	10	20	30	
	Profile 1b												
	GROUND ELEVATION: 1082.8												
1'2"	TOPSOIL: Black sandy silt												
	SANDY TILL: Light brown silty fine sand to sandy silt, trace gravel		1080										
4'0"													
	SAND AND GRAVEL: Compact to dense fine to medium sand and gravel												
7'6"			1075										
	SAND: Compact fine to medium sand, trace gravel stratified												
			1070										
14'6"	Test Pit terminated 14'6".												Test Pit dry during excavation.
	Test Pit No. 55 Profile 1c Group Elevation: 1086.0												
1'0"	TOPSOIL: Black sandy silt		1085										
	SANDY TILL: Compact light brown silty fine sand to sandy silty, trace some gravel												
6'0"			1080										Test Pit dry during excavation.
	SAND AND GRAVEL: Dense to very dense brown fine to medium sand and gravel, some cbbbles and boulders												
			1075										
14'0"	Test Pit terminated 14'0".												Test Pit dry during excavation.
	Test Pit No. 56 Profile 3a Ground Elevation: 1058.4												
1'0"	TOPSOIL: Black sandy silt												
	SANDY TILL: Compact to dense light brown silty fine sand, some gravel and cobbles with occasional boulders, occasional fragments of fractured limestone		1055	1 C.S.									M & H
			1050										
12'6"	Test Pit terminated 12'6".												Test Pit dry during excavation.

NOTES:

CHECKED BY: BRG



PETO MACCALLUM LTD.
CONSULTING GEOTECHNICAL ENGINEERS

LOG OF TEST PIT No. 151 & 152

JOB NAME PROPOSED SUBDIVISION

JOB No. 76 F 220

LOCATION Kortright and Downey Roads, Guelph, Ontario

BORING DATE Oct. 6, 1976

ENGINEER J.B.D.

BORING METHOD Backhoe

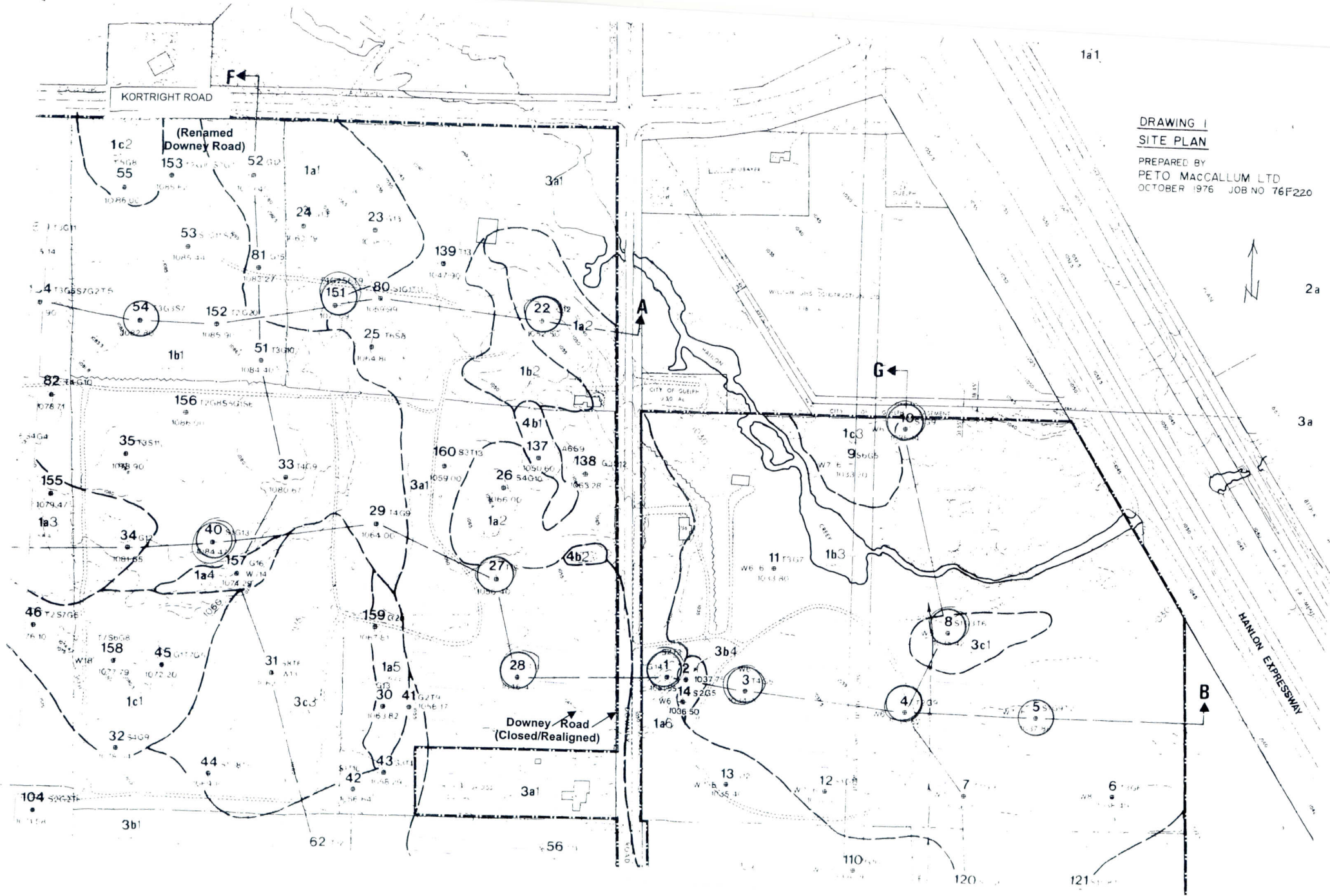
TECHNICIAN J.B.D.

SOIL PROFILE			SAMPLES		SHEAR STRENGTH C_u				LIQUID LIMIT W_L			GROUNDWATER OBSERVATIONS AND REMARKS		
DEPTH	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/FOOT N - VALUES	DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST				PLASTIC LIMIT W_P			
							BLOWS/FOOT				WATER CONTENT %			
							20	40	60	80	W_p		W	W_L
Profile 3a (151)														
GROUND ELEVATION: 1071.1														
1'6"	TOPSOIL: Black sandy silt													

NOTES:

CHECKED BY





DRAWING 1
SITE PLAN

PREPARED BY
PETO MACCALLUM LTD
OCTOBER 1976 JOB NO 76F220



2a

3a

HANLON EXPRESSWAY

Downey Road
(Closed/Realigned)



JOB NAME Hanlon Recharge Pond, City of Guelph

JOB No. 76 F 148

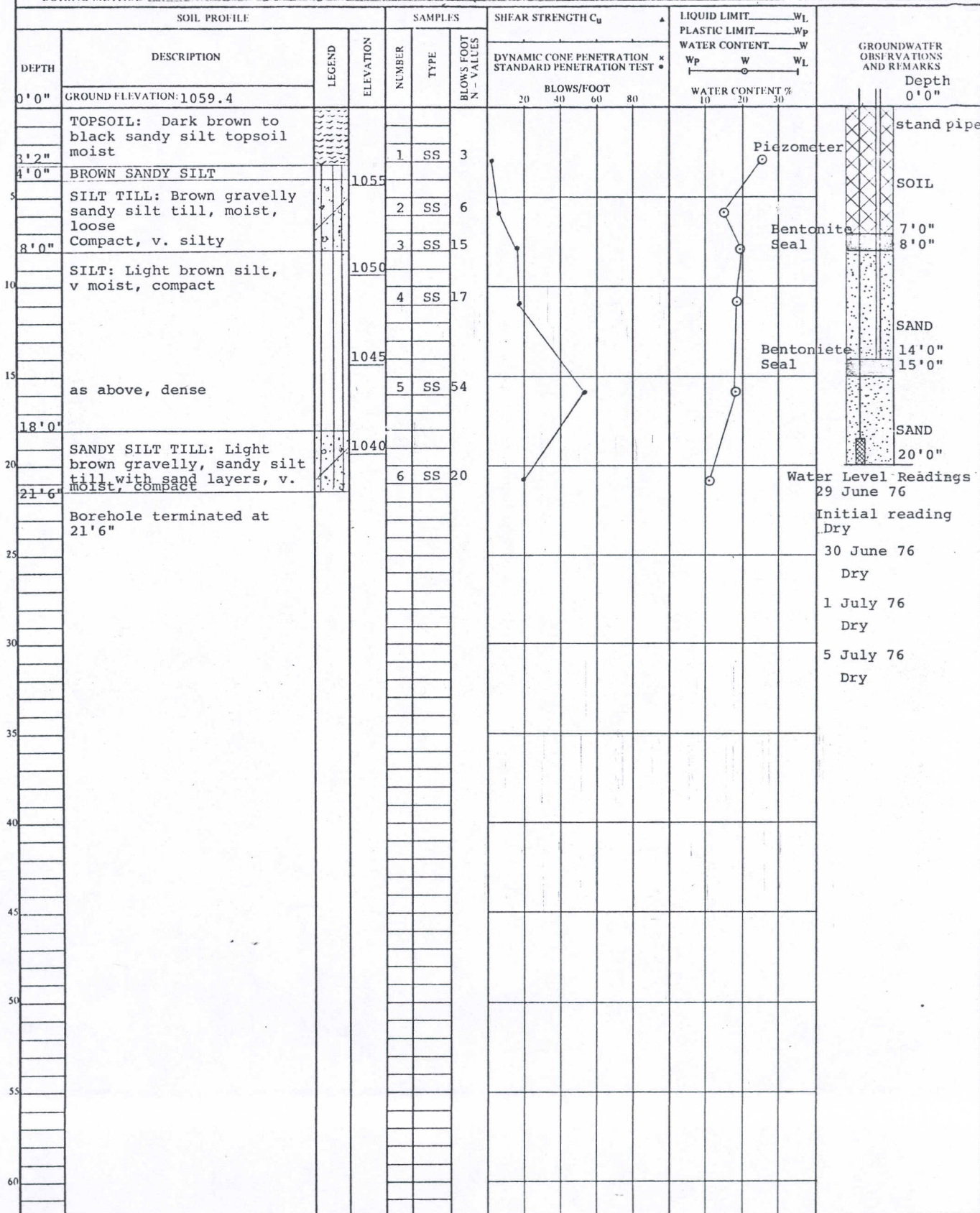
LOCATION E. of Hanlon Parkway N. of Cole Road

BORING DATE June 29/76

ENGINEER GDP/JD

BORING METHOD 5" dia. Flight augers

TECHNICIAN W.J.



NOTES:

CHECKED BY



JOB NAME: Hanlon Recharge Pond, City of Guelph

JOB No. 76 F 148

LOCATION E. of Hanlon Parkway N. of Cole Road

BORING DATE 29 June 76

ENGINEER GDP/JD

BORING METHOD 5" dia. Flight augersTECHNICIAN WJ[illegible]

NOTES:

CHECKED BY _____



JOB NAME Hanlon Recharge Pond, City of Guelph

JOB No. 76 F 148

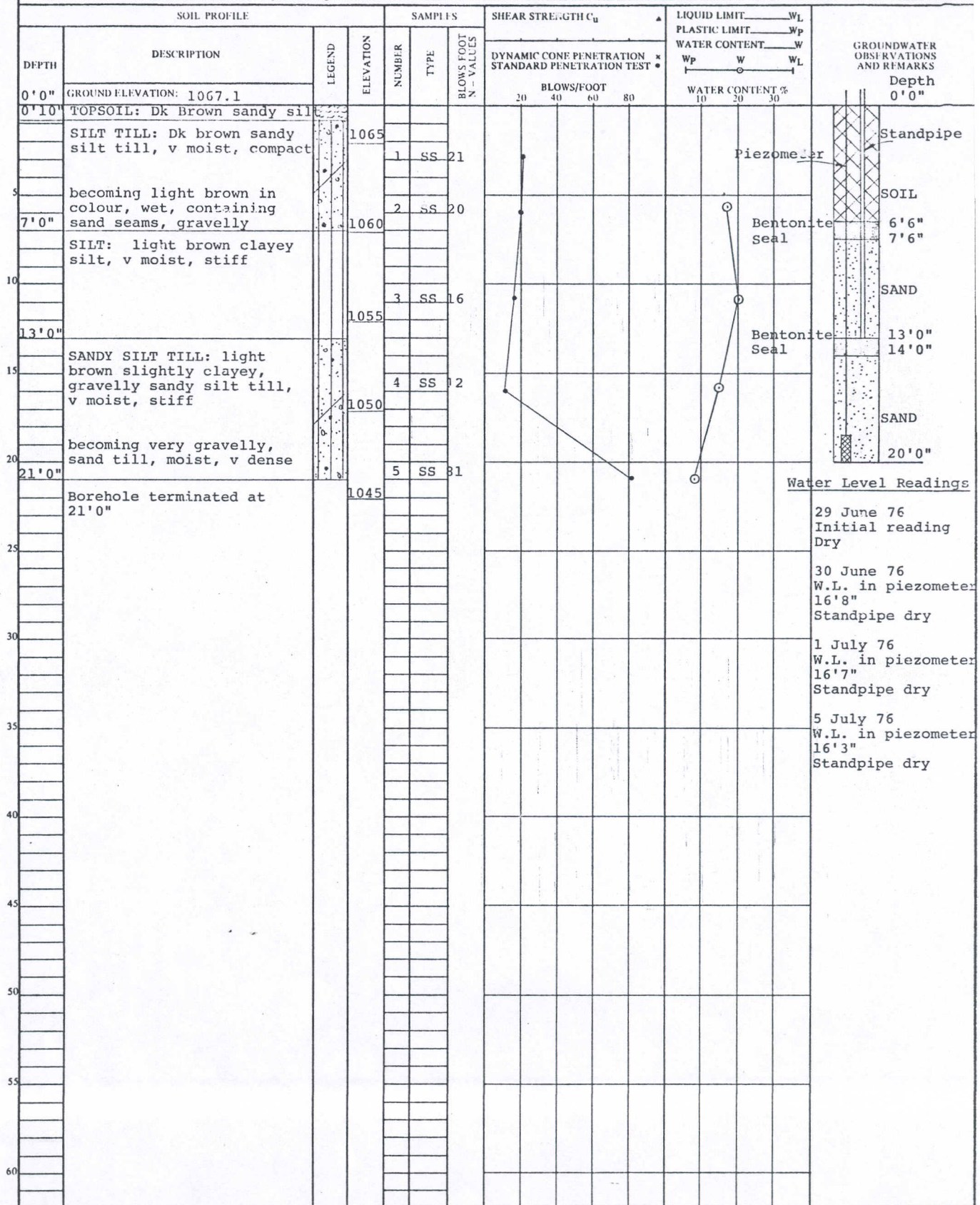
LOCATION E. of Hanlon Parkway, N. of Cole Road

BORING DATE 29 June 76

ENGINEER GDP/JD

BORING METHOD 5" dia. Flight augers

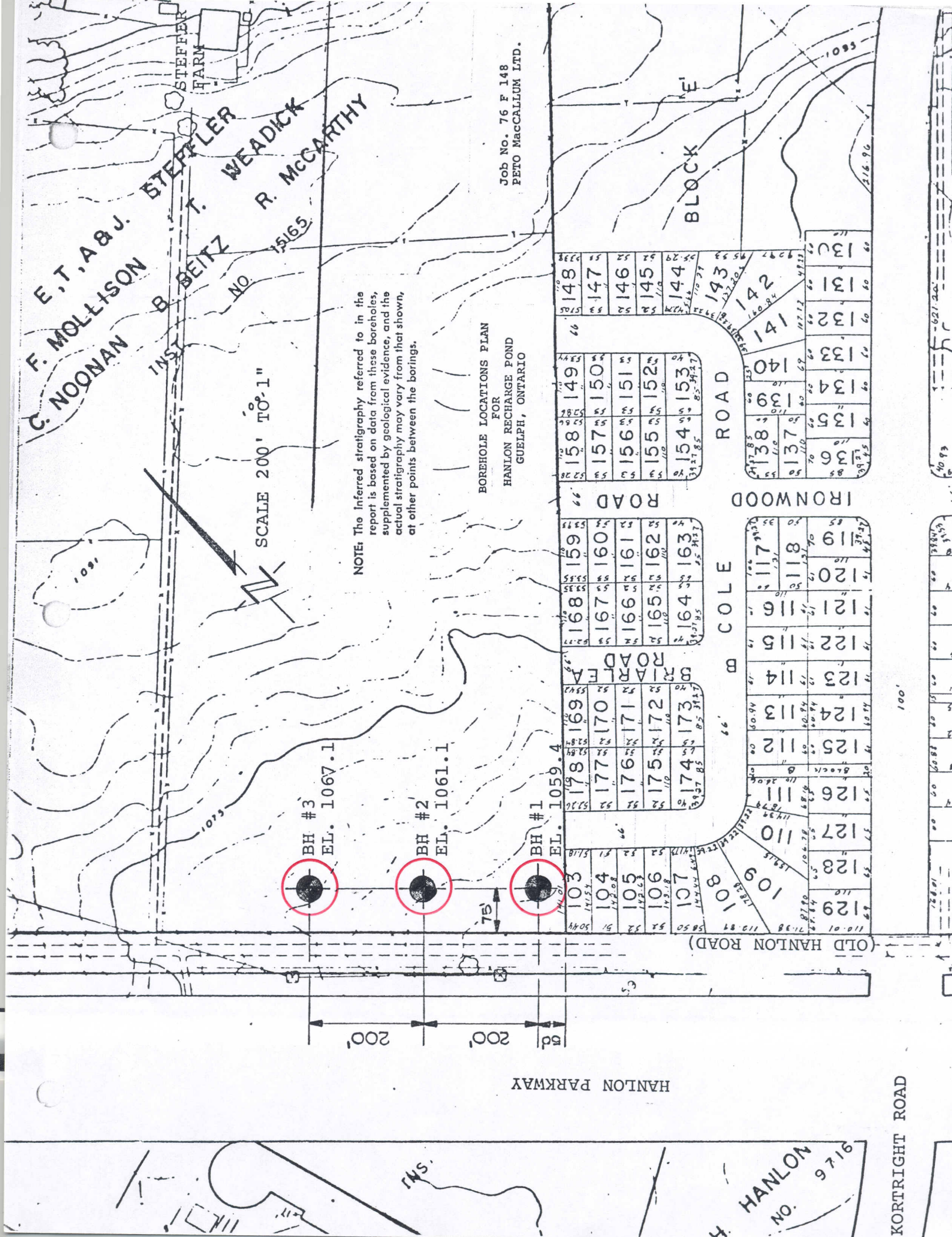
TECHNICIAN WJ



NOTES:

CHECKED BY





E.T. & J. STEFFLER
F. MOLLISON
C. NOONAN
B. BEITZ
T. WEADICK
R. MCCARTHY
NO. 15165

SCALE 200' TO 1"

NOTE: The Inferred stratigraphy referred to in the report is based on data from these boreholes, supplemented by geological evidence, and the actual stratigraphy may vary from that shown, at other points between the borings.

BOREHOLE LOCATIONS PLAN
FOR
HANLON RECHARGE POND
GUELPH, ONTARIO

Job No. 76 F 148
PETO MACCALLUM LTD.

148	147	146	145	144	143	142	141	140	139	138	137	136	135	134	133	132	131	130
50.28	50.3	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52
158	149	157	156	155	154	153	140	139	138	137	136	135	134	133	132	131	130	129
52.28	52.3	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53
168	167	166	165	164	163	162	161	160	159	158	157	156	155	154	153	152	151	150
53.27	53.3	53.53	53.53	53.53	53.53	53.53	53.53	53.53	53.53	53.53	53.53	53.53	53.53	53.53	53.53	53.53	53.53	53.53
178	177	176	175	174	173	172	171	170	169	168	167	166	165	164	163	162	161	160
54.27	54.3	54.53	54.53	54.53	54.53	54.53	54.53	54.53	54.53	54.53	54.53	54.53	54.53	54.53	54.53	54.53	54.53	54.53
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
50.4	50.5	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52	50.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
51.18	51.2	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
51.18	51.2	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52	51.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
52.18	52.2	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
52.18	52.2	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52	52.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
53.18	53.2	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
53.18	53.2	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52	53.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
54.18	54.2	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
54.18	54.2	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52	54.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
55.18	55.2	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
55.18	55.2	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52	55.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
56.18	56.2	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
56.18	56.2	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52	56.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
57.18	57.2	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
57.18	57.2	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52	57.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
58.18	58.2	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
58.18	58.2	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52	58.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
59.18	59.2	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
59.18	59.2	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52	59.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
60.18	60.2	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
60.18	60.2	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52	60.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
61.18	61.2	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
61.18	61.2	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52	61.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
62.18	62.2	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
62.18	62.2	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52	62.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
63.18	63.2	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
63.18	63.2	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52	63.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
64.18	64.2	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52
103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
64.18	64.2	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52	64.52
129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
65.18	65.2	65.52	65.52	65.52	65.52	65.52	65.52	65.52	65.52	65.52	65.52	65.52	65.52	65.52	65.52	65.52	65.52	65.52
103	10																	



HYDROLOGY CONSULTANTS LIMITED

RECHARGE STUDY
HANLON HEIGHTS SUBDIVISIONNE-4
RECORD OF BOREHOLE BH 1/73

Water Level/Date _____

Elevation (Local datum)	Depth (ft)	Soil Description	Strat. Plot and Standpipe Installation	Remarks
	0	Elev. 1061' A.S.L. 323.4		
	2.5	Top soil		4' auger hole
	322.6	0.76		Wet at 2.4'
	5.0	Dirty Sand		Backfilled with cuttings
	321.4	6.5	1.98	
	7.5	Till - silty sand with pebbles		
	321	8.0	2.4	
	10.0			
	12.5			
	15.0			
	17.5			



HYDROLOGY CONSULTANTS LIMITED

RECORD OF BOREHOLE RH 217RECHARGE STUDY
HANLON HEIGHTS SUBDIVISION

Water Level/Date _____

Elevation (Local datum) Depth (ft)	Soil Description	Strat. Plot and Standpipe Installation	Remarks
0	Elev. 1061' A.S.L. 323.4		
322.95 1.5	Topsoil		
2.5	0.45		4" auger hole
5.0	Coarse Sand (1.35)		Backfilled with cuttings
321.6 7.5	1.8		
12	Till - silty sand with pebbles		Wet at 8.2'
10.0	3.0		
320.4			
12.5			
15.0			



HYDROLOGY CONSULTANTS LIMITED

RECHARGE STUDY
HANLON HEIGHTS SUBDIVISIONRECORD OF BOREHOLE BH 3/P

Water Level/Date _____

Elevation (Local datum) Depth (ft)	Soil Description	Strat. Plot and Standpipe Installation	Remarks
0	Elev. 1057' A.S.L. 322.2		
2.5 321.4	Topsoil - brown black coarse dirty sand with pebbles 0.76		4" auger hole open.
5.0 4.5 320.8	Brown coarse dirty sand with pebbles 0.64 1.4		
7.5	Fill - brown silty sand with pebbles stones, boulders 1.6		wet at 5.5'
10.0	3.0 319.2		
12.5			
15.0			



HYDROLOGY CONSULTANTS LIMITED

RECHARGE STUDY
HANLON HEIGHTS SUBDIVISIONTNET-1
RECORD OF BOREHOLE TH 2/73

Water Level/Date _____

Elevation (Local datum)	Depth (ft)	Soil Description	Strat. Plot and Standpipe Installation	Remarks
	0	Elev. 1061' A.S.L. 323.4		
	2.5	Top soil		1 1/2" plastic pipe 9' below ground 2' above ground.
	5	Dirty sand		Water level 3.8' b.g.l. (June 1/73)
	8			Water level 7.92' b.g.l. (July 12/73)
	10			Pipe slotted 5 feet from bottom
	15	Till - Fine silty sand with pebbles		Backfilled with cuttings
	20			4" auger hole.
	25			
	30			
	35			



HYDROLOGY CONSULTANTS LIMITED

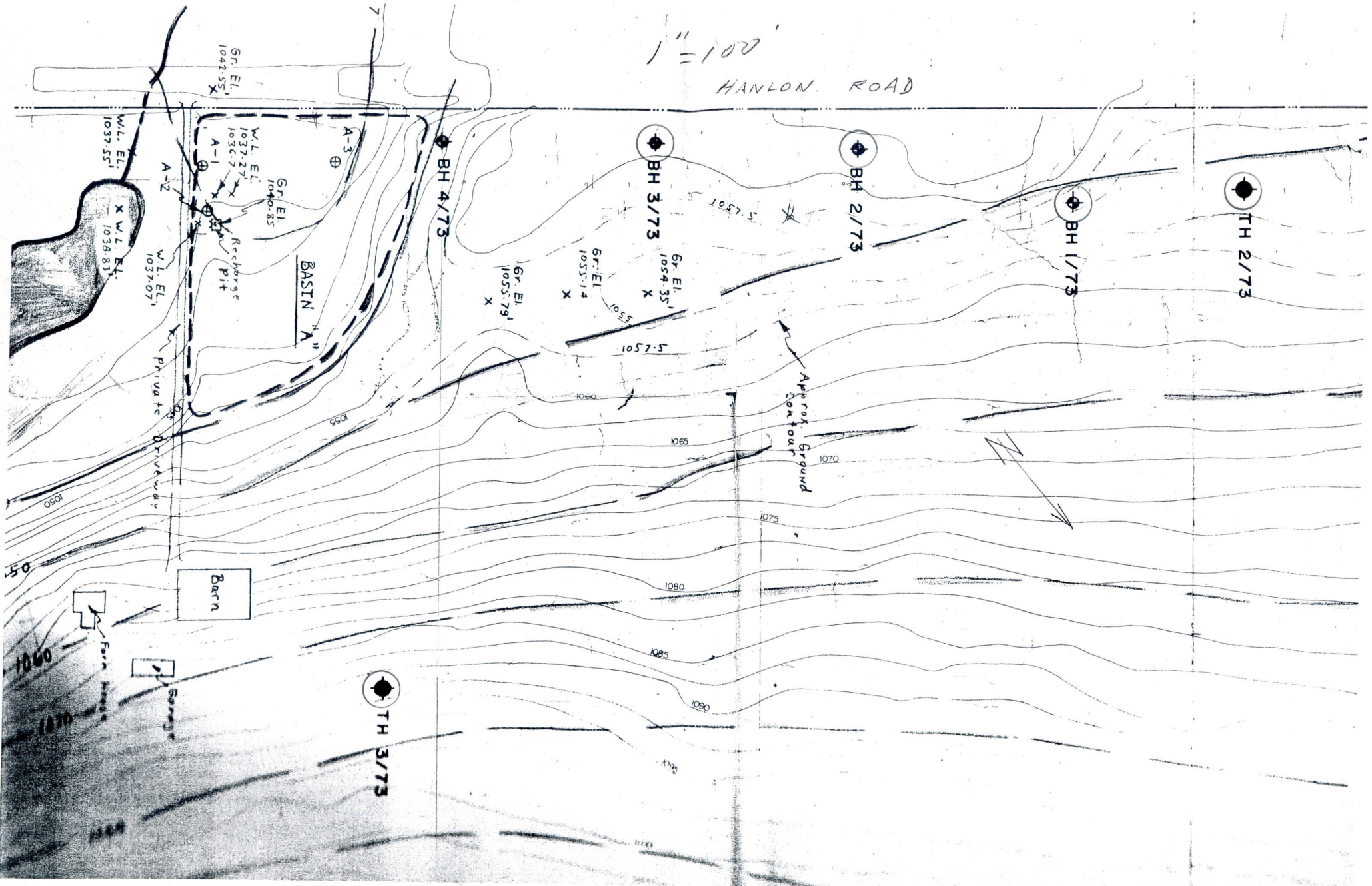
RECORD OF BOREHOLE TH 3/73RECHARGE STUDY
HANLON HEIGHTS SUBDIVISION

Water Level/Date _____

Elevation (Local datum)	Depth (ft)	Soil Description	Strat. Plot and Standpipe Installation	Remarks
		Elev. 1088' A.S.L.		
	0	331.6		1 1/2" plastic pipe
	1	03 Top soil!		30' below ground
		331.3		3' above ground
		Till - Brown, silty		
		(1.2) with pebbles.		4" auger hole
	5	330.1		
		1.5		
	10			
		Till - Light Brown,		
		silty with		
	15	pebbles		
		Stones at		
		13' ft.		
	20	(7.6)		Water level 16.81' b.g.l. (July 12/73)
	25			Pipe slotted 10' from bottom
	30	322.5		Backfilled with cuttings.
		9.1		

1" = 100'

HANLON ROAD





LAIRD ROAD



PETO MACCALLUM LTD.
CONSULTING ENGINEERS

LOG OF BOREHOLE No. 1, 2,
3

JOB NAME PROPOSED SATELLITE MANUFACTURING PLANT FOR AMERICAN MOTORS (CANADA) INC.

JOB No. 86 F 16

LOCATION Laird Road and Southgate Drive, Guelph, Ontario

BORING DATE 1986.01.15

ENGINEER R.K.B.

BORING METHOD Continuous Flight Solid Stem Augers

TECHNICIAN L.F.

SOIL PROFILE				SAMPLES		SHEAR STRENGTH C _u				LIQUID LIMIT W _L			GROUNDWATER OBSERVATIONS AND REMARKS	
DEPTH (ft.)	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/FOOT N - VALUES	DYNAMIC CONE PENETRATION * STANDARD PENETRATION TEST *				WATER CONTENT W _p			
							BLOWS/FOOT				WATER CONTENT %			
	Borehole 1 Ground Elevation: 1093.4						20	40	60	80	10	20	30	
0.7	TOPSOIL: Dark brown gravelly, sandy silt topsoil, moist		1090	1	SS	94/15 in.								
5.0	SAND AND GRAVEL: Very dense brown sand and gravel, numerous cobbles and bould- ers to 10 in. diameter, some silt, damp		1085											
	BOREHOLE TERMINATED AT 5.0 ft. DUE TO AUGER REFUSAL ON A BOULDER (1)													Upon completion of drilling, no free water, bore- hole open.
	Borehole 2 Ground Elevation: 1096.0													
0.7	TOPSOIL: Dark brown gravelly, sandy silt topsoil, moist		1095	1	AS	(2)								
	SAND AND GRAVEL: Very dense brown sand and gravel numerous cobbles and bould- ers to 10 in. diameter, some silt, damp - very hard augering		1090											
			1085											
15.0			1080	2	SS	75								
	BOREHOLE TERMINATED AT 15.0 ft.													Upon completion of drilling, no free water, bore- hole open.
	Borehole 3 Ground Elevation: 1094.8													
0.8	TOPSOIL: Dark brown gravelly, sandy silt topsoil, moist		1090											
	SAND AND GRAVEL: Very dense brown sand and gravel, numerous cobbles and bould- ers to 10 in. diameter, some silt, damp			1	SS	100/13 in.								
6.1	BOREHOLE TERMINATED AT 6.1 ft. DUE TO AUGER REFUSAL ON A BOULDER		1085											Upon completion of drilling, no free water, bore- hole open.

NOTES: (1) Auger equipment was broken during drilling
(2) Numerous cobbles, unable to taken a split spoon sample,
therefore auger sample was taken

CHECKED BY: RKB





PETO MacCALLUM LTD.
CONSULTING ENGINEERS

LOG OF BOREHOLE No. 4, 5, 6

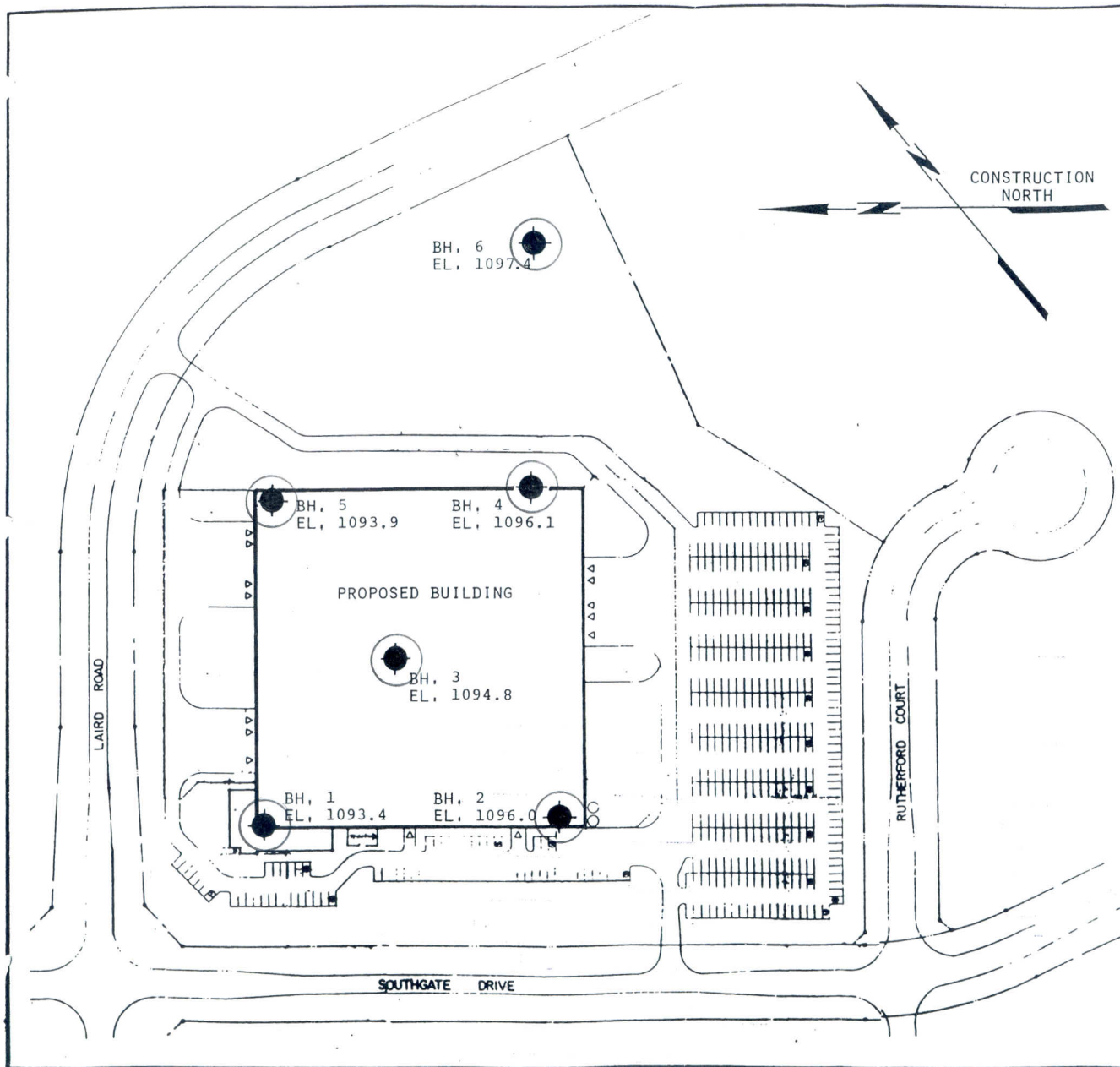
JOB NAME PROPOSED SATELLITE MANUFACTURING PLANT FOR AMERICAN MOTORS (CANADA) INC. JOB No. 86 F 16
LOCATION Laird Road and Southgate Drive, Guelph, Ontario BORING DATE 1986.01.15 ENGINEER R.K.B.
BORING METHOD Continuous Flight Hollow Stem Augers TECHNICIAN L.F.

SOIL PROFILE						SAMPLES		SHEAR STRENGTH C_u		LIQUID LIMIT W_L		GROUNDWATER OBSERVATIONS AND REMARKS	
DEPTH (ft.)	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/FOOT N - VALUES	DYNAMIC CONE PENETRATION STANDARD PENETRATION TEST *		PLASTIC LIMIT W_p		WATER CONTENT % W		
							BLOWS/FOOT		WATER CONTENT %				
							20 40 60 80		10 20 30				
							20 40 60 80		10 20 30				
Borehole 4 GROUND ELEVATION: 1096.1													
0.8	TOPSOIL: Dark brown gravelly, sandy silt topsoil, moist		1095									Upon completion of drilling, no free water, bore- hole open.	
	SAND AND GRAVEL: Very dense brown sand and gravel, numerous cobbles and bould- ers to 10 in. diameter, some silt, damp		1090										
8.0													
BOREHOLE TERMINATED AT 8.0 ft. DUE TO AUGER REFUSAL ON A BOULDER													
Borehole 5 Ground Elevation: 1093.9													
1.0	TOPSOIL: Dark brown gravelly, sandy silt topsoil, moist		1090										Upon completion of drilling, no free water bore- open.
	SAND AND GRAVEL: Very dense brown sand and gravel, numerous cobbles and bould- ers to 10 in. diameter, some silt, damp			1	AS	(2)							
5.0													
BOREHOLE TERMINATED AT 5.0 ft. DUE TO AUGER REFUSAL ON A BOULDER													
Borehole 6 Ground Elevation: 1097.4													
1.0	TOPSOIL: Dark brown gravelly, sandy silt topsoil, moist		1095									Upon completion of drilling, no free water, bore- hole open	
	SAND AND GRAVEL: Very dense brown sand and gravel, numerous cobbles and bould- ers to 10 in. diameter, some silt, damp			1	AS	(2)							
5.5													
BOREHOLE TERMINATED AT 5.5 ft. DUE TO AUGER REFUSAL ON A BOULDER													

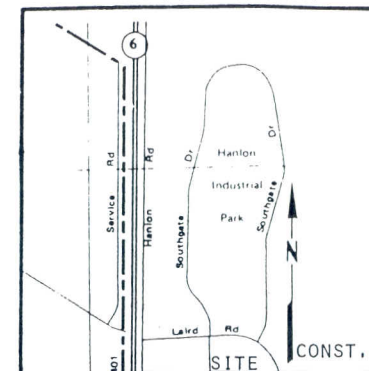
NOTES: (1) Numerous cobbles, unable to take a split spoon sample
(2) Numerous cobbles, unable to take a split spoon sample,
therefore auger sample was taken

CHECKED BY: RKB





KEY PLAN (N.T.S.)



LEGEND



SCALE



REFERENCE

SITE PLAN RECEIVED FROM CLIENT

NOTES

BOREHOLE LOCATIONS AND GROUND SURFACE ELEVATIONS WERE OBTAINED FROM BLACK, SHOEMAKER, ROBINSON AND DONALDSON LTD.

INDUCON CONSULTANTS OF CANADA LTD.

PROPOSED SATELLITE MANUFACTURING PLANT
AMERICAN MOTORS (CANADA) INC.

BOREHOLE LOCATION PLAN



PETO MacCALLUM LTD.
CONSULTING ENGINEERS

DRAWN	ALH	DATE	SCALE	JOB NO.	DRAWING NO.
CHECKED	RKB				
APPROVED	JBD	JAN, 1986	AS SHOWN	86 F 16	1

LOG OF BOREHOLE NO. 1 & 2

PROJECT PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION Southgate Drive, Guelph, Ontario

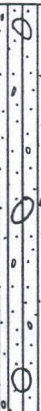

BORING DATE 1989 01 09

OUR PROJECT NO. 89 F 4

ENGINEER G. Mitchell

BORING METHOD Continuous Flight Solid Stem Augers

TECHNICIAN D. Burt

SOIL PROFILE			SAMPLES			SHEAR STRENGTH C_u		LIQUID LIMIT W_L		PLASTIC LIMIT W_P		WATER CONTENT W		GROUND WATER OBSERVATIONS AND REMARKS	
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	DYNAMIC CONE PENETRATION * STANDARD PENETRATION TEST *		WATER CONTENT %		WATER CONTENT %				
							BLOWS/0.3m		WATER CONTENT %		WATER CONTENT %				
	BOREHOLE 1 GROUND ELEVATION 333.86						20	40	60	80	10	20	30		
	SANDY SILT TILL: Very dense brown sandy silt, little gravel, occasional cobbles, moist to very moist			1	SS	100/225 mm*									
				2	SS	96									
1.5				3	SS	115									
				4	SS	110/225 mm									
3.0				5	SS	122									
4.5															
5.05	BOREHOLE TERMINATED AT 5.05 m													Upon completion of drilling, borehole open with no free water	
	BOREHOLE 2 GROUND ELEVATION 333.93														
	SANDY SILT TILL: Very dense brown sandy silt, little gravel, occasional cobbles, moist to very moist			1	SS	80									
				2	SS	79									
1.5				3	SS	73									
				4	SS	101									
3.0															
4.5															
5.05	BOREHOLE TERMINATED AT 5.05 m													Upon completion of drilling, borehole open with no free water	

NOTES: * Frozen ground

CHECKED BY: *LB*

LOG OF BOREHOLE NO. 3 & 4

PROJECT PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION Southgate Drive, Guelph, Ontario

BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 1989 01 09

OUR PROJECT NO. 89 F 4

ENGINEER G. Mitchell

TECHNICIAN D. Burt

SOIL PROFILE				SAMPLES			SHEAR STRENGTH C_u		LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			GROUND WATER OBSERVATIONS AND REMARKS		
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	DYNAMIC CONE PENETRATION * STANDARD PENETRATION TEST *		WATER CONTENT % W_P W W_L					
							BLOWS/0.3M							
							20	40	60	80	10		20	30
BOREHOLE 3 GROUND ELEVATION 333.78														
	SANDY SILT TILL: Very dense brown sandy silt, little gravel, occasional cobbles, moist to very moist		333											
				1	SS	66								
1.5				332	2	SS	69							
				331	3	SS	55							
3.0				4	SS	54								
			330											
4.5														
			329	5	SS	124								
5.05	BOREHOLE TERMINATED AT 5.05 m											Upon completion of drilling, borehole open with no free water		
BOREHOLE 4 GROUND ELEVATION 334.28														
	SANDY SILT TILL: Very dense brown sandy silt, little gravel, occasional cobbles, moist to very moist		334											
				333	1	SS	97							
1.5					2	SS	100/250 mm							
				332										
					3	SS	114							
3.0			331	4	SS	111								
3.65	Occasional silty sand seams													
4.5			330											
				5	SS	115*								
5.05	BOREHOLE TERMINATED AT 5.05 m											Upon completion of drilling, borehole open with no free water		

NOTES: * Driving on cobble

CHECKED BY: *DB*

LOG OF BOREHOLE NO. 5 & 6

PROJECT PROPOSED INDUSTRIAL DEVELOPMENT



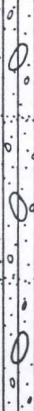
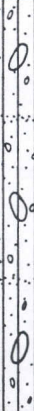
LOCATION Southgate Drive, Guelph, Ontario

BORING METHOD Continuous Flight Solid Stem Augers

BORING DATE 1989 01 09

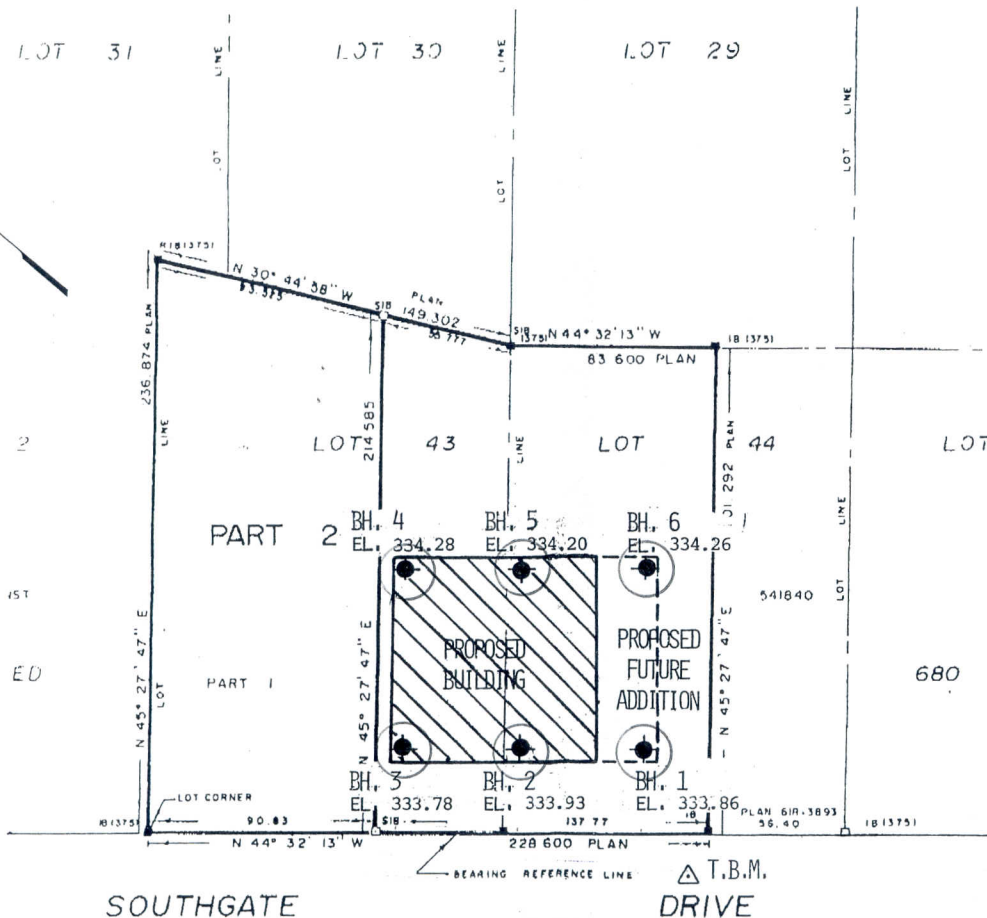
OUR PROJECT NO. 89 F 4
ENGINEER G. Mitchell

TECHNICIAN D. Burt

SOIL PROFILE		SAMPLES				SHEAR STRENGTH C_u		LIQUID LIMIT W_L		PLASTIC LIMIT W_p		WATER CONTENT W		GROUND WATER OBSERVATIONS AND REMARKS	
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	DYNAMIC CONE PENETRATION * STANDARD PENETRATION TEST *		BLOWS/0.3M		WATER CONTENT %				
									20	40	60	80	10		20
BOREHOLE 5															
GROUND ELEVATION 334.20															
	SANDY SILT TILL: Very dense brown sandy silt, little gravel, occasional cobbles, occasional silty sand seams, moist to very moist		333	1	SS	119									
1.5				2	SS	115/275 mm									
			332												
				3	SS	126									
3.0			331	4	SS	100/150 mm									
	BOREHOLE 5		330												
4.5				5	SS	155									
5.05	BOREHOLE TERMINATED AT 5.05 m												Upon completion of drilling, borehole open with no free water		
BOREHOLE 6															
GROUND ELEVATION 334.26															
	SANDY SILT TILL: Very dense brown sandy silt, little gravel, occasional cobbles, occasional silty sand seams, moist to very moist		333	1	SS	150									
1.5				2	SS	110									
			332												
				3	SS	90									
3.0			331	4	SS	84									
	BOREHOLE 6		330												
4.5				5	SS	93									
5.05	BOREHOLE TERMINATED AT 5.05 m												Upon completion of drilling, borehole open with no free water		

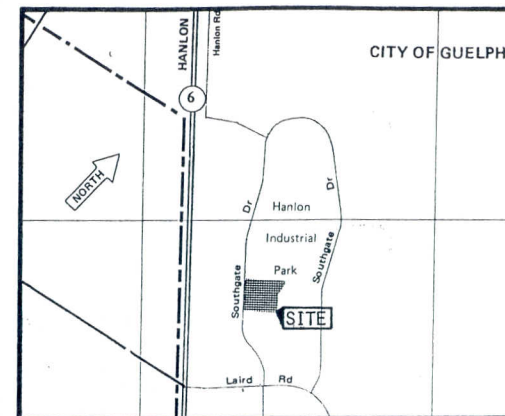
NOTES:

CHECKED BY 



NOTE:

THE INFERRED STRATIGRAPHY REFERRED TO IN THE REPORT IS BASED ON THE DATA FROM THESE BOREHOLES SUPPLEMENTED BY GEOLOGICAL EVIDENCE. THE ACTUAL STRATIGRAPHY BETWEEN THE BORINGS MAY VARY.



KEY PLAN (N.T.S.)

LEGEND:

BOREHOLE

T.B.M. - TEMPORARY BENCH MARK: TOP OF MANHOLE ON SOUTHGATE DRIVE, ELEVATION: 331.79 (GEODETIC, METRIC)

REFERENCE:

REPRODUCED FROM SITE PLAN SUPPLIED BY CRD CONSTRUCTION LIMITED,

CRD CONSTRUCTION LTD.

PROPOSED INDUSTRIAL BUILDING, METALUMEN MANUFACTURING
SOUTHGATE DRIVE
GUELPH, ONTARIO

BOREHOLE LOCATION PLAN

Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	D.B.	DATE	SCALE	JOB NO.	DRAWING NO.
CHECKED	DB	JAN. 1989	1 : 2000	89 F 4	1
APPROVED					

LOG OF TEST PIT NO. 1



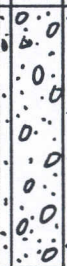
PROJECT SEPTIC SYSTEM INVESTIGATION

PML REF. 99 KF 70

LOCATION 6662 Laird Dr., Lots 7 and 8, Conc. 5, Township of Puslinch

ENGINEER G. Mitchell

DATE June 23, 1999

DEPTH	DESCRIPTION	LEGEND	SAMPLE NUMBER	SHEAR STRENGTH kPa 50 100 150 200	WATER CONTENT % 10 20 30	GROUNDWATER OBSERVATIONS AND REMARKS
(m)	GROUND ELEVATION N/A					
0.30	TOPSOIL: Dark brown sandy silt, rootlets, moist					
0.80	SAND: Reddish brown silty sand, moist					
1.85	SILTY SAND AND GRAVEL: Compact brown silty sand and gravel, trace clay, moist, occasional sand seams					
	TEST PIT TERMINATED AT 1.85 m					Upon completion of excavation, test pit open with no free water.

NOTES

CHECKED BY 

LOG OF TEST PIT NO. 2

PROJECT SEPTIC SYSTEM INVESTIGATION

PML REF. 99 KF 70

LOCATION 6662 Laird Dr., Lots 7 and 8, Conc. 5, Township of Puslinch

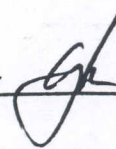
ENGINEER G. Mitchell

DATE June 23, 1999

DEPTH	DESCRIPTION	LEGEND	SAMPLE NUMBER	SHEAR STRENGTH kPa 50 100 150 200	WATER CONTENT % 10 20 30	GROUNDWATER OBSERVATIONS AND REMARKS
(m)	GROUND ELEVATION N/A					
0.30	TOPSOIL: Dark brown sandy silt, rootlets, moist	~ ~ ~				
2.10	SAND: Compact reddish brown to brown fine sand, trace silt, moist	• • •				
	TEST PIT TERMINATED AT 2.10 m					Upon completion of excavation, test pit open with no free water.

NOTES

CHECKED BY



LOG OF TEST PIT NO. 3

PROJECT SEPTIC SYSTEM INVESTIGATION

PML REF. 99 KF 70

LOCATION 6662 Laird Dr., Lots 7 and 8, Conc. 5, Township of Puslinch

ENGINEER G. Mitchell

DATE June 23, 1999

DEPTH	DESCRIPTION	LEGEND	SAMPLE NUMBER	SHEAR STRENGTH kPa				WATER CONTENT %			GROUNDWATER OBSERVATIONS AND REMARKS
(m)	GROUND ELEVATION			50	100	150	200	10	20	30	
0.35	TOPSOIL: Dark brown sandy silt, rootlets, moist	~ ~ ~									
2.50	SAND: Compact reddish brown to brown fine sand, trace silt, moist	• • •									
	TEST PIT TERMINATED AT 2.50 m										Upon completion of excavation, test pit open with no free water.

NOTES

CHECKED BY

