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W.P. No. 127-66-01

CONT. No.

W. O. No.

STR. SITE No.

HWY. No. 403

LOCATION Hwy 403 AND 401

FROM West Limits of 401/27 INTERCHANGE

~~NEAR PAGESHA~~ Through 401/403/410 COMPLEX

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

MEMORANDUM

~~30M12~~ -
30M12-90

Mr. G.C.E. Burkhardt, (2)
Regional Structural Planning Eng.,
Central Region,
90 Floral Pkwy.,
Downsview.

FROM:

Foundations Office,
Design Services Branch,
West Bldg., Downsview.

ATTENTION: Downsview.

DATE:

July 20, 1972.

OUR FILE REF.

IN REPLY TO

JUL 26 1972

SUBJECT:

Preliminary
FOUNDATION INVESTIGATION REPORT
For
Proposed Hwy's. #403 & #401 from
West Limits of 401/27 Interchange
Through 401/403/410 Complex
South-Westerly to Hwy. #10
Town of Mississauga, County of Peel
District #6 (Toronto)
W.O. 72-11053 -- W.P. 127-66-01

Attached we are forwarding to you our detailed
foundation investigation report on the subsoil conditions
existing at the above-mentioned site.

We believe that the factual data and recommendations
contained therein will prove adequate for your design
requirements. Should additional information be required,
please do not hesitate to contact our Office.



A. G. Stermac,
PRINCIPAL FOUNDATIONS ENGINEER.

AGS/ao

Attch.

cc; Messrs. D. W. Farren

B. R. Davis

A. Rutka

P. J. Harvey

H. Greenland

B. J. Giroux

T. J. Kovich

G. A. Wrong

B. A. Singh

Town of Mississauga

Foundation of Canada Engineering Corp. Ltd.

Foundations Files ✓

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7. SUMMARY.

8. MISCELLANEOUS.

Preliminary
FOUNDATION INVESTIGATION REPORT
For
Proposed Hwy's. #403 & #401 from
West Limits of 401/27 Interchange
Through 401/403/410 Complex
South-Westerly to Hwy. #10
Town of Mississauga County of Peel
District 6 Toronto
W.O. 72-11053 W.P. 127-66-01

1. INTRODUCTION:

The present proposals for the construction program of Hwy. #401-Hwy. #403 complex are as follows:

- 1) Hwy. 403 / Hwy. 10 Interchange
- 2) Hwy. 403 easterly to Cawthra Rd.
- 3) Hwy. 403 / Hwy. 403 Extension / Cawthra Rd. complex
- 4) Hwy. 403 northerly to Hwy. 401 / Brampton Expressway, including Base Line Road Interchange
- 5) Hwy. 403 / Hwy. 401 / Brampton Expressway (Hwy. 410) complex
- 6) Hwy. 401 easterly from Hwy. 403 to Hwy. 427.

The above program was assigned high priority by the Ministry. In order to assess the foundation considerations, a detailed preliminary subsoil investigation was initiated by the Foundations Office as per request from Central Region Structural Planning Office (Memo from Mr. G.C.E. Burkhardt, Regional Structural Planning Engineer, dated April 5, 1972). The main purpose of this investigation is to provide sufficient information to the design consultants (Foundation of Canada Engineering Corporation Limited) for the pre-design study. The results of this investigation will also guide Systems Design in their quest for a balanced design.

After the completion of the field work, a meeting was held on May 17, 1972 between the representatives of Foundation of Canada Engineering Corporation Ltd. and the Ministry of Transportation and Communications, to discuss the subsoil conditions and the preliminary assessment of the foundation requirements.

This report presents all the factual information obtained from this investigation. Included are recommendations pertaining to foundation design at the various structure sites, as well as the stability and settlement considerations associated with the approach fills.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The area under investigation is bounded by the following:

North - Hwy. 401

South - Half a mile south of Base Line Road

West - Hwy. 10

East - Etobicoke Creek

It is, therefore, located in the town of Missisauga, County of Peel. The ground surface of the general area varies from elevations 500 to 600 and is generally sloping towards Lake Ontario. The land is primarily used for farming purposes with occasional light housing. An east-west running C.P.R. Line is present about two miles south of the general area. The area under investigation is drained by Little Etobicoke Creek, Cooksville Creek and their tributaries. These creeks and tributaries can present a flood problem during the spring.

The site is located in the physiographic region known as the "Peel Plain". The characteristic deposit, in the vicinity of the area under investigation, is composed of a cohesive glacial till whose thickness is anywhere between about 2 and 50 feet. In this region, the Credit River, Oakville and Etobicoke Creeks have cut deep valleys into the overburden. There is, therefore, no large undrained depression, swamp or bog in this area, although in many of the interstream areas drainage is still imperfect.

The overburden is underlain by grey shale bedrock of the Meaford-Dundas formation, Ordovician Period.

3. FIELD AND LABORATORY WORK:

Thirty-one sampled boreholes, each accompanied by dynamic cone penetration tests, were put down during the course of field investigation. The borings were advanced by continuous Flight Auger machines (commercially known as C.M.E. 55C) adapted for soil sampling purposes.

Samples of the overburden were obtained in a 2" O.D. split-spoon sampler at required depths. The sampler was hammered into the soil with a driving energy of 350 ft. lb./blow. Bedrock was proven in most of the boring locations by obtaining BX or BXL size rock core samples.

Groundwater level observations were carried out, during the period of the investigation, in the open boreholes. In addition, piezometers were installed at several boring locations where artesian water pressure was encountered. Piezometric water level readings were taken periodically until they were stabilized.

The soil, bedrock and groundwater conditions encountered at the boring locations, are presented in the Record of Borelog sheets. The location and elevation of the various boreholes were provided by personnel from Engineering Surveys, Central Region. The elevations in this report are referred to a Geodetic datum. Boring locations and elevations are shown on Drawing No. 72-11053A. Estimated stratigraphical sections are also plotted on Drawings No. 72-11053B and C.

All the samples were subjected to careful visual examination in the field and subsequently in the laboratory. Following this examination, laboratory tests were carried out on selected representative samples to determine the physical properties of the various soil types encountered, namely:

- Natural Moisture Content
- Atterberg Limits
- Grain-Size Distribution

The results of this testing are plotted on the Record of Borelog sheets and summarized on Figures No. 1 to 3, inclusive, all contained in Appendix I of this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General:

The extent and composition of the overburden, within the area under investigation, varies markedly. The predominant stratum across the site is composed of a heterogeneous mixture of hard clayey silt with some sand and gravel, with silty sand layers up to 4 feet in thickness. The thickness of this cohesive glacial till stratum varies from 2 feet (B.H. #2A)

to 51 feet (B.H.'s #5 and #23). In the vicinity of Base Line Road and Cawthra Road, this cohesive stratum is underlain by an extensive granular deposit of very dense silty sand and gravel. It is inferred that this granular stratum is underlain by shale bedrock. Elsewhere, the cohesive glacial till stratum is directly underlain by shale bedrock.

A low-lying swampy area exists in the vicinity of Base Line Rd. and First Line.

The stratigraphical sequence encountered in the borings is plotted on the Record of Borelog sheets. Stratigraphical sections have been inferred from this data and plotted on Drawings No. 72-11053B and C. The subsoil and bedrock encountered from ground surface downward, is presented in the following subsections.

4.2) Fill Material:

A number of borings were put down along the existing roadways. At these locations up to 6 feet of fill material was encountered. The fill material is composed of a mixture of clayey silt with some sand and gravel, which is similar in composition to the underlying glacial till. Standard Penetration Testing carried out within the fill material gave 'N' values between 7 and 23 blows/foot. These values would indicate that the fill has been subjected to a moderate degree of compaction.

4.3) Surficial Organic Deposit:

The presence of a localized surficial organic deposit, in the vicinity of Base Line Rd. and First Line, was identified by Mr. B. Sen Mathur, Airphoto Interpretation Engineer, in a report to this Office, dated June 22, 1972. His complete report is enclosed in Appendix II. The approximate plan limits of this organic terrain are shown on Maps 2 and 3 of this report. Based on his airphoto study, Mr. Mathur infers that the surficial organic material is relatively shallow. No borings were put down in the area defined as being organic terrain.

4.4) Glacial Till (Clayey Silt with Sand and Gravel):

This stratum was encountered in all boring locations. It is of a heterogeneous mixture of clayey silt with some sand and gravel. The thickness of this glacial till stratum varies between 2 feet (B.H. #2A) and 51 feet (B.H.'s #5 and #23). Occasional silty sand layers, up to 4 feet in thickness, were encountered within this stratum. Grain-size distribution

curves, for the samples of this stratum, are plotted on Figure 2 of Appendix I.

Results of Atterberg Limit Tests, performed on samples recovered in this stratum were plotted on the Record of Borelog sheets, as well as on the plasticity chart, Figure 1. They are also tabulated below:

Liquid Limit	(W _L)	%	15-38
Plastic Limit	(W _p)	%	12-23
Natural Moisture Content	(W)	%	7-15

Referring to the table, it can be seen that the cohesive till is inorganic with a plasticity in the low range.

Standard Penetration Testing was carried out within this cohesive stratum and the results were plotted on the Borelog sheets. The 'N' value varies from 13 blows/foot to 100 blows per one inch. Based on these 'N' values, it is estimated that the consistency of this cohesive material varies from stiff to hard.

4.5) Silty Sand to Sandy Silt with Gravel:

Between Stations 1240 + 00 and 1300 + 00 (Hwy. #403), in the vicinity of Cawthra Rd. and Base Line Rd., the cohesive glacial till stratum is underlain by an extensive deposit of silty sand to sandy silt with some gravel. This granular deposit was found to be from 14 feet (B.H. #2C) to 108 feet (B.H. #9) in thickness. Grain-size distribution curves, for the samples recovered within this deposit, are plotted on Figure 3 of Appendix I.

Standard Penetration Testing carried out in this stratum, in general, gave 'N' values higher than 100 blows/ft. Based on these values, it is estimated that the relative density of the granular deposit is generally very dense.

4.6) Bedrock:

Bedrock was found underlying the granular deposit, where it exists, or the cohesive till stratum elsewhere. The bedrock was proven in most of the boring locations by obtaining 4 to 15 feet of BX or BXL size rock core samples.

The bedrock core samples were examined by Mr. K.W. Ingham, Geologist, Ministry of Transportation and Communications. Mr. Ingham presented the results of his bedrock description, as well as an interpretation of geologic conditions existing at this site, in a letter to this

Office, dated July 14, 1972. A copy of this letter is enclosed in Appendix III of this report.

The dominant type of bedrock encountered across the site is a dark grey shale with occasional bands of limestone and/or sandstone. The bedrock surface at the proposed crossing of Hwy. #403 and Hwy. #10 was found to be fairly flat at elevations between 518 and 520. The bedrock, however, would appear to dip easterly towards Base Line Road and Cawthra Road to an estimated elevation of 350. Elsewhere, at this site, the bedrock surface varies between elevations 456 and 620. The bedrock, in general, was found to be in a sound condition. However, in certain boring locations the upper 1 to 6 feet appears to be weathered and fractured. A bulking factor of 10-15% can be used for the shale and limestone bedrock being excavated.

5. GROUNDWATER CONDITIONS:

Groundwater level observations have been carried out during the period of the investigation by recording the water level in the open boreholes, as well as in piezometers. The observations are recorded on the Borelog sheets and summarized on Drawings No. 72-11053B and C. The results of the measurements in the open boreholes indicate that the groundwater level, excluding the areas where artesian conditions were encountered, ranges from 1 to 18 feet below existing ground surface, which corresponds to elevations between 471 (B.H. #5) and 596.5 (B.H. #13). The groundwater level over the major portion of the area, however, ranges from elevations 480 to 500.

An artesian groundwater pressure head was encountered at each of the borings put down in the vicinity of the intersection of Base Line Road and Cawthra Rd., namely boreholes #6 to #9, inclusive. This artesian condition was encountered once the borings penetrated through the cohesive glacial till stratum down into the lower granular deposit. Once this occurred the groundwater rose instantaneously in the casing, stabilizing itself at levels between 4 and 24 feet above existing ground surface, corresponding to elevations between 501 and 516. In order to establish the variation in pressure within the boreholes, piezometers were installed at various depths. The results of the readings taken in these piezometers are plotted on Drawings 72-11053B and C, as well as on Figure #4. Referring to Figure #4,

it can be seen that the piezometric groundwater pressures in this area follow a consistent pattern, which finds the excess artesian head generally increasing with depth. Further, the artesian head is not confined solely to the lower granular deposit, instead it dissipates throughout the cohesive glacial till stratum as well.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

This report deals with the proposed construction of Hwy. 403 and Hwy. 401 from the west limits of the 401/27 Interchange through the 401/403/410 complex south-westerly to Hwy. 10. The overall complex is shown in plan on Drawing No. 72-11053A. The existing Hwy. 401, from Hwy. 27 westerly, is to be developed as a 16-lane basic core-collector, but for the most part, will be 18-laned due to speed change lane requirements. The proposed Hwy. 403 from Cawthra Road westerly will be multi-laned; it will incorporate a wide median (approximately 270 feet), which will provide for future roadways or rapid transit. Hwy. 403 will be constructed as Collectors from Hwy. 10 to Cawthra Road, cores from Base Line Road to Hwy. 401 and collectors again on Hwy. 401. Cawthra Road becomes the Hwy. 403 collectors, and hence, the Brampton Expressway (Hwy. 410) north of Hwy. 401. Hwy. 403 Extension east of Cawthra Road will be built with four lanes to Tomken Road and two lanes to Dixie Road for lane balance reasons.

A number of interchanges are proposed for this project, specifically:

- 1) Hwy. 403 / Hwy. 10 Interchange
- 2) Hwy. 403 / Hwy. 403 Extension / Cawthra Road complex
- 3) Hwy. 403 / Base Line Road Interchange
- 4) Hwy. 403 / Hwy. 401 / Brampton Expressway (Hwy. 410) Complex
- 5) Hwy. 401 / Dixie Road Interchange
- 6) Hwy. 401/ Airport Entrance / Little Etobicoke Creek Complex
- 7) Hwy. 401 / First Line Interchange.

In addition, a storm sewer is to be installed in the vicinity of the Hwy. #403 - Hwy. #10 interchange.

The subsoil, bedrock and groundwater conditions, encountered in the area under investigation, have been discussed previously in this report

in Sections 4 and 5. Inferred stratigraphical profiles, along the proposed alignment, are shown on Drawings W.O. 72-11053B and C.

At this stage, the profile grades at the structure crossings, as well as other pertinent data, have not been finalized. Preliminary profiles (unnumbered) for the grade line along Hwy #403 (between Stations 1150 + 00 and 1390 + 00), however, were made available.

Preliminary design data, recommendations pertaining to foundation design of the various structures, as well as the stability and settlement considerations for the approach fills, will be presented in the sub-sections to follow. For brevity's sake, as many of the recommendations as possible will be presented in tabular form.

6.2) Hwy.'s #10 and 403 Complex:

	<u>Crossing</u>	<u>Type</u>	<u>Pg. No.</u>
6.2.1)	Hwy. #10 and 403	Underpass	9
6.2.2)	Storm Sewer	-	10

FOUNDATION RECOMMENDATIONS

6.2.1) Underpass Structure - Hwy. 10 and 403

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APPROX. EXISTING GROUND ELEV. (Approx. Grade of Hwy. #403)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURE	APPROACHES Longitudinal - 23' (Max.) Transverse - 21' (Max.)	
525 to 529 (526)	Fill Material - Clayey Silt or silty Sand (5' to 6') Glacial Till - Cohesive - (2.5' to 3.5') Underlain by Shale Bedrock. (Refer to B.H.'s 1 and 2)	<p><u>PIERS:</u> Spread Footings founded within the glacial till. Allowable bearing pressure up to 5 t.s.f.</p> <p><u>ABUTMENTS:</u> 'Perched' on spread footings in the approach fills, within a zone composed of well-compacted granular material, using an allowable bearing value of 2.5 t.s.f. Alternatively, end-bearing piles driven to bedrock. - Estimated tip elev. 518 to 519. - designed for the max. allowable capacity for the pile section chosen.</p> <p><u>Note:</u> Differential settlements between spread footings supported abutments and adjacent piers will not exceed 1/2 ".</p>	<p><u>STABILITY:</u> Approaches up to 23' (with 2:1 slopes) will be stable. (F.S. \geq 1.3) Probable Elastic Settlements: 21' Fill (2:1 slopes) - Negligible</p>	-----

6.2.2) Storm Sewer (Refer to B.H.'s #26, #27, #28, #29 and #30):

The bedrock in this area is overlain by shallow overburden (1.5 to 4 feet). The sewer will, therefore, probably be located within the bedrock. No major complications are envisaged with regard to the placement and performance of concrete sewer pipe.

The bedding and backfilling for the sewer should be carried out in accordance with current Ministry of Transportation and Communications practices, namely Standard DD-823 - unyielding foundation, Type B-3 bedding.

6.3) Hwy. #403 - Hwy. #403 Extension - Cawthra Rd. Complex
(Three Structures):

	<u>Crossing</u>	<u>Type</u>	<u>Pg. No.</u>
6.3.1)	Cawthra Rd. Ramp S.W. - Hwy. #403	Underpass	12
6.3.2)	Hwy. #403 Extension - Cawthra Rd.	Underpass	13
6.3.3)	Hwy. #403 - S.B. Cawthra Rd.	Underpass	14
6.3.4)	Hwy. #403 Cut Treatment Stations 1275 + 00 to 1290 + 00	---	15

FOUNDATION RECOMMENDATIONS

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Underpass Structure

6.3.1) Cawthra Rd. Ramp S.W. - Hwy. #403

APPROX. EXISTING GROUND ELEV. (Approx. Grade of Hwy. #403)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURE	APPROACHES Longitudinal - 25' (Max.) Transverse - 9' (Max.)	
489 ± (473)	Glacial Till - Cohesive - Very stiff to hard (51') Underlain by shale bedrock. (Refer to B.H. #5)	<u>PIERS:</u> Spread footings founded at or below elev. 468, within the glacial till stratum. Allowable bearing pressure 5 t.s.f. <u>ABUTMENTS:</u> 'Perched' on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing value of 2.0 t.s.f. Alternatively, end-bearing piles driven to practical refusal within the glacial till deposit. - Estimated tip elev. 470. - designed for the max. allowable capacity for the pile section chosen. <u>Note:</u> Differential settlements between spread footing supported abutments and piers will not exceed 1/4 inch	<u>STABILITY:</u> Approaches up to 25' (with 2:1 slopes) will be stable (F.S. ≥ 1.3) <u>Probable Elastic Settlements:</u> 9' Fill (2:1 slopes) Negligible	Hwy. #403 will be in a cut section extending approximately 16 feet below the existing ground surface. The cut will be in a relatively impervious cohesive glacial till stratum. - The cut section will be inherently stable, provided i) the final slopes are no steeper than 2:1 and ii) the slopes are seeded and mulched.

FOUNDATION RECOMMENDATIONS

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Underpass Structure
6.3.2) Hwy. #403 Extension - Cawthra Rd.

APPROX. EXISTING GROUND ELEV. (Approx. grade of Hwy. #403Ext.)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURE	APPROACHES	
			Fills max. Height 25'	
490 to 492 (492)	Glacial Till - Cohesive - Very stiff to hard. (25') Silty sand. - Very dense (36' to 43') Underlain by shale bedrock. (Refer to B.H.'s #3 and 4)	<u>PIERS:</u> - Spread footings founded at or below elev. 478 within the glacial till stratum. Allowable bearing pressure 4 t.s.f. <u>ABUTMENTS:</u> 'Perched' on spread footings in the approach fills, within a zone composed of well-compacted granu- lar material, using an allowable bearing value of 2.0 t.s.f. Alternatively, end-bearing piles driven to practical refusal with- in the silty sand deposit. - Estimated tip elev. 462 - designed for the max. allowable capacity for the pile section cho- sen. <u>Note:</u> Differential settlements between the spread footing supported piers and abutments will not exceed 1/2".	<u>STABILITY:</u> Approaches up to 25' (with 2:1 slopes) will be stable (F.S. ≥ 1.3) <u>Probable Elastic Settlement:</u> 25' Fill (2:1 slopes) 1" max.	-----

FOUNDATION RECOMMENDATIONS

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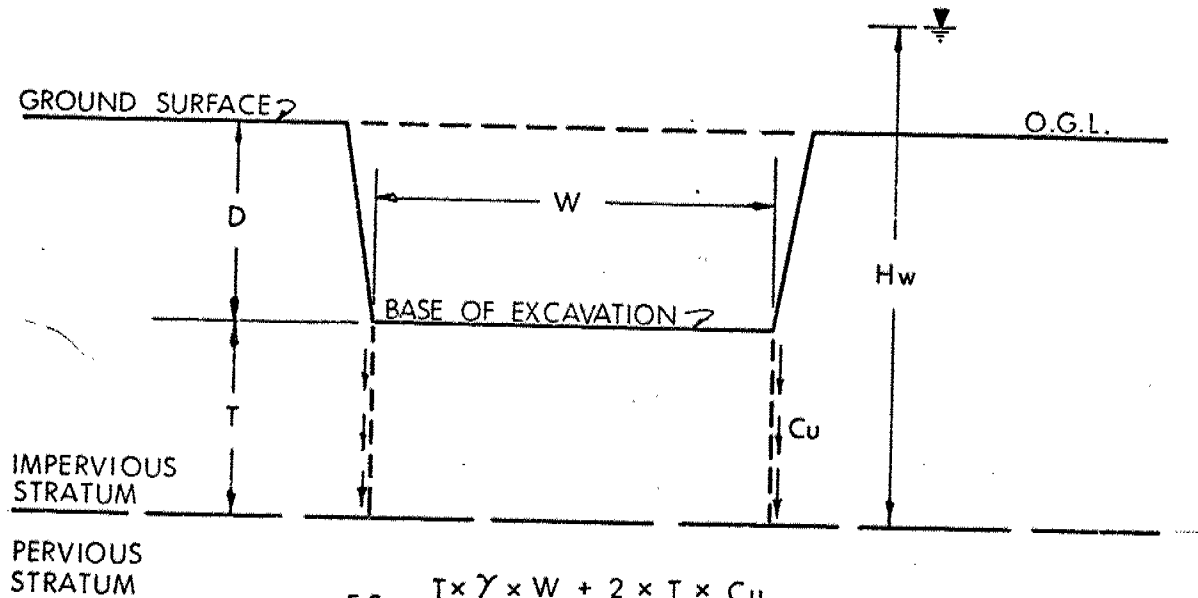
Underpass Structure

6.3.3) Hwy. #403 - S.B. Cawthra Road

APPROX. EXISTING GROUND ELEV. (Approx. Grade of Hwy. #403)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURE	APPROACHES Longitudinal - 22' (Max.) Transverse - 11' (Max.)	
498 ± (487)	<p>Glacial Till</p> <ul style="list-style-type: none"> - Cohesive - Hard (25') <p>Silty sand</p> <ul style="list-style-type: none"> - Very dense (35' +) <p>(Refer to B.H. #6)</p> <p><u>Note:</u> High artesian head encountered in the silty sand deposit underlying the glacial till. Head as much as 24 feet above existing ground surface.</p>	<p><u>PIERS:</u> Spread footings founded within the glacial till stratum at or below elev. 483. Allowable bearing pressure 4 t.s.f.</p> <p><u>ABUTMENTS:</u> 'Perched' on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing value of 2.5 t.s.f.</p> <ul style="list-style-type: none"> - It may not be advisable to found the abutments on piles since the piles may tap the artesian zone and adversely affect the stability of the overall structure complex. <p><u>Note:</u> Differential settlements between the spread footing supported piers and abutments will not exceed 1".</p>	<p><u>STABILITY:</u> Approaches up to 22' (with 2:1 slope) will be stable). (F.S. ≥ 1.3)</p> <p><u>NOTE:</u> The basal stability of the Hwy. #403 cut section must be ensured. (Refer to "Remarks" column and sub-section 6.3.4).</p> <p><u>Probable Elastic Settlement:</u> 11' Fill (2:1 slopes) Negligible.</p>	<ul style="list-style-type: none"> - Under the present scheme Hwy. #403 will be in cut between Stations 1245 + 00 and 1290 + 00. The maximum depth of cut is to be of the order of 11'. - Because of the artesian condition existing between Stations 1275 + 00 to 1290 + 00 it may be advisable to raise the grade of 403 in this area, and thus limit the depth of cut. This will be discussed in Sub-Section 6.3.4).

6.3.4) Cut Treatment - Hwy. #403 (Stations 1275 + 00 to 1290 + 00):

Under the present scheme Hwy. #403 will be in cut between Stations 1245 + 00 and 1290 + 00. The maximum depth of cut is to be of the order of 11 feet. As mentioned previously, an artesian pressure head exists in the lower granular deposit, between Stations 1275 + 00 and 1290 + 00; the recorded artesian head was as much as 24 feet above the existing ground surface. (for a plot of the artesian pressure head v.s. elevations refer to Figure #4). There is a danger that the base of the excavation, between the latter stations, might heave due to the unbalanced artesian pressure head existing. The basal stability of the cut in this area should be determined using the following technique.



$$F.S. = \frac{T \times \gamma \times W + 2 \times T \times C_u}{\gamma_w \times H_w \times W}$$

where:

- F.S. - factor of safety with respect to basal stability of excavation (recommended minimum value 1.3)
- T - vertical distance between base of excavation and the boundary between the impervious and pervious strata (in feet)
- D - Depth of excavation (in feet)
- W - Width of excavation (in feet)
- H_w - Unbalanced hydrostatic water pressure head acting at the boundary of the impervious and pervious strata (in feet)

C_u - Undrained shear strength of subsoil (in p.s.f.)

γ - Bulk unit weight of subsoil (in p.c.f.)

γ_w - Bulk unit weight of water (p.c.f.)

For a long, wide excavation the 2.T. C_u expression is negligible, therefore, the expression reduces to
$$F.S. = \frac{T \cdot \gamma}{\gamma_w H_w}$$

For an 11 feet deep cut, the following values could be used ($T = 14$ feet, $\gamma = 125$ p.c.f., $\gamma_w = 62.4$ p.c.f. and $H_w = 40$ feet). Under these conditions, the factor of safety would be less than unity and thus, the base of the excavation could be expected to heave. This being the case, consideration should be given to raising the profile grade of Hwy. #403, between Stations 1275 + 00 and 1290 + 00. This would reduce the depth of cut required, and improve the basal stability of the excavation. From this preliminary assessment, it is recommended that the depth of cut be limited to something of the order of 5 to 6 feet.

It should be stressed that the recommendations, presented in the previous paragraph, are based on the limited data obtained for this preliminary investigation. Additional detailed information, with regard to factors such as the artesian pressure head existing between Stations 1275 + 00 and 1290 + 00, will be obtained during the final investigation phase.

6.4) Hwy. #403 - Base Line Road:

	<u>Crossing</u>	<u>Type</u>	<u>Pg. No.</u>
6.4.1)	Hwy. #403 - Base Line Rd.	Underpass	18
6.4.2)	Swamp Treatment (Immediately North of Base Line Road)	---	19

6.4.1) FOUNDATION RECOMMENDATIONS
Underpass Structure
Hwy. #403 - Base Line Rd.

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APPROX. EXISTING GROUND ELEV. (Approx. Grade of Hwy. #403)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURE	APPROACHES Transverse - 20' (Max.) Longitudinal - 25' (Max.)	
497.5 to 499 (493 ±)	<p>Fill material</p> <ul style="list-style-type: none"> - clayey silt with sand and gravel (6' to 7') <p>Glacial Till</p> <ul style="list-style-type: none"> - Cohesive - Stiff to hard. (20' to 34') <p>Silty sand and gravel.</p> <ul style="list-style-type: none"> - Dense to very dense. (100' +) <p>NOTE: High artesian head encountered in the silty sand deposit underlying the glacial till. Head as much as 24' above existing ground surface (Refer to B.H.'s #7 & #8)</p>	<p><u>PIERS:</u></p> <p>Spread footings founded within the glacial till stratum at or below elev. 489. Allowable bearing pressure 4 t.s.f.</p> <p><u>ABUTMENTS:</u></p> <p>'Perched' on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing pressure of 2.5 t.s.f.</p> <p>- It may not be advisable to found the abutments on piles, since the piles may tap the artesian zone and adversely affect the stability of the overall structure complex.</p> <p>NOTE: Differential settlements between the spread footing supported piers and abutments will not exceed 1".</p>	<p><u>STABILITY:</u></p> <p>Approaches up to 25' (with 2:1 slopes) will be stable. (F.S. \geq 1.3)</p> <p><u>Probable Elastic Settlement</u></p> <p>20' Fill (2:1 slopes) 1" maximum.</p>	<p>- Hwy. #403 will be in cut between Stations 1245 + 00 and 1290 + 00. This cut is to have a maximum depth of 11' below existing ground surface. The stability of this cut section was discussed in detail in Sub-Section 6.3.4).</p>

6.4.2) Swamp Treatment:

North of Base Line Rd. Hwy. #403 will cross the most easterly leg of a swamp, the limits of which were defined by Mr. B. Sen Mathur, Airphoto Interpretation Engineer (refer to Sub-Section 4.3). Based on his study, Mr. Mathur inferred that the surficial organic deposit was quite thin. If this is the case, then the organic material can economically be sub-excavated and backfilled with granular material, in accordance with current Ministry of Transportation and Communications practices, prior to placement of any fill along the Hwy. #403 alignment.

It is recommended that the vertical and lateral limits of the surficial organic material be investigated by the Central Region Materials Section, prior to the final design stage.

6.5) Hwy. #403 - Hwy. #401 - Brampton Expressway Complex (14 Structures):

	<u>Crossing</u>	<u>Type</u>	<u>Pg. No.</u>
6.5.1)	Hwy. #403 - Brampton Exp. (N.B.)	Overpasses (3)	21
6.5.2)	Brampton Exp. - Hwy. #401 (E.B. & W.B)	Overpasses (4)	22
6.5.3)	Hwy. #401 - Brampton Exp. Ramp (N.E.)	Underpass (1)	23
6.5.4)	Hwy. #403 - Hwy. #401	Underpasses (5)	24
6.5.5)	Hwy.'s #401, & # 403 - Heart Lake Rd.	Underpass (1)	25

FOUNDATION RECOMMENDATIONS
6.5.1) Overpass Structures (Three)
Hwy. #403 - Brampton Expressway (N.B.)

- 21 -

APPROX. EXISTING GROUND ELEV. (Approx. Grade of Hwy. #403)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURE	APPROACHES Longitudinal - 22' (Max.) Transverse - 7' (Max.)	
578 ± (571 ±)	Glacial Till - Cohesive - Hard (7') Underlain by shale bedrock. (Refer to B.H. #10)	<u>PIERS:</u> Spread footings founded within the glacial till. Allowable bea- ring pressure 5 t.s.f. <u>ABUTMENTS:</u> 'Perched' on spread footings in the approach fills, within a zone composed of well compacted granu- lar material, using an allowable bearing pressure of 2.0 t.s.f. Alternatively, end-bearing piles driven to bedrock. - estimated tip elevation 571. - designed for the max. allowable capacity for the pile section chosen. <u>NOTE:</u> Differential settlements between spread footing supported abutments and adjacent piers will not exceed ½".	<u>STABILITY:</u> Approaches up to 22' (with 2:1 slopes) will be stable. (F.S. ≥ 1.3) <u>Probable Elastic Settlement</u> 7' Fill (2:1 slopes) Negligible.	-----

FOUNDATION RECOMMENDATIONS
6.5.2) Overpass Structures (Four)
Brampton Expressway - Hwy. #401 (E.B. and W.B.)

- 22 -

APPROX. EXISTING GROUND ELEV. (Approx. Grade of Hwy. #401)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURES	APPROACHES Longitudinal - 21' (Max.) Transverse - 23' (Max.)	
602 to 604 (624 to 626)	Glacial Till - Cohesive - Hard (7.5' to 13') Underlain by shale bedrock. (Refer to B.H.'s #15 and #16)	<u>PIERS:</u> Spread footings founded within the glacial till at or below elevation 599. Allowable bearing pressure up to 4.5 t.s.f. <u>ABUTMENTS:</u> 'Perched' on spread footings in the approach fills within a zone composed of well compacted granu- lar material, using an allowable bearing value of 2.5 t.s.f. Alternatively, end-bearing piles driven to bedrock. - Estimated tip elevation 591 to 595. - designed for the maximum allow- able capacity for the pile section chosen. <u>NOTE:</u> Differential settlements between spread footing supported abutments and adjacent piles will not exceed ½".	<u>STABILITY:</u> Fills up to 23' (with 2:1 slo- pes) will be stable. (F.S. \geq 1.3) <u>Probable Elastic Settlement</u> 23' Fill (2:1 slopes). ½" maximum.	-----

FOUNDATION RECOMMENDATIONS
6.5.3) Underpass Structure
Hwy. #401 - Brampton Expressway Ramp (N.E.)

- 23 -

APPROX. EXISTING GROUND ELEV. (Approx. Grade of Hwy. #401)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURE	APPROACHES Fill Height - 34' (Max.)	
602.5 to 606.5 (638)	Glacial Till - Cohesive - Hard (8.5' to 12') Underlain by shale bedrock. (Refer to B.H.'s #13 and #14)	<u>PIERS:</u> Spread footings founded within glacial till, at or below elev. 604. Allowable bearing pressure up to 5.0 t.s.f. <u>ABUTMENTS:</u> 'Perched' on spread footings in the approach fills, within a zone composed of well compacted granu- lar material, using an allowable bearing value of 2.0 t.s.f. Alternatively, end-bearing piles driven to bedrock. - Estimated tip elev. 590 to 597. - designed for the maximum allow- able capacity for the pile sec- tion chosen. <u>NOTE:</u> Differential settlements between spread footing supported abutments and adjacent piers will not exceed 1".	<u>STABILITY:</u> Fills up to 34' (with 2:1 slopes) will be stable. (F.S. \geq 1.3) <u>Probable Elastic Settlement</u> 34' Fill (2:1 slopes) - 1" to 2"	-----

FOUNDATION RECOMMENDATIONS
6.5.4) Underpass Structures (Five)
Hwy. #403 - Hwy. #401

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APPROX. EXISTING GROUND ELEV. (Approx. Grade of Hwy. #403)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURES	APPROACHES Fill Height - 30' Maximum	
569 to 592.5 (Variable)	Glacial Till - Cohesive - Hard. (4' to 10') Underlain by shale bedrock. (Refer to B.H.'s #17, #18 and 20)	<p><u>PIERS:</u> Spread footings founded within the glacial till or on bedrock. Allowable bearing pressure 4 t.s.f. and 10 t.s.f., respectively.</p> <p><u>ABUTMENTS:</u> 'Perched' on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing value of 2.5 t.s.f. Alternatively, end-bearing piles driven to bedrock. - designed for the maximum allowable capacity of the pile section chosen.</p> <p><u>NOTE:</u> Differential settlements between spread footing supported abutments and adjacent piers will not exceed 1".</p>	<p><u>STABILITY:</u> Fills up to 30' (with 2:1 slopes) will be stable. (F.S. \geq 1.3)</p> <p><u>Probable Elastic Settlement</u> - 1" maximum.</p>	-----

FOUNDATION RECOMMENDATIONS

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6.5.5) Underpass Structure
Hwy.'s #401 and #403 - Heart Lake Rd.

APPROX. EXISTING GROUND ELEV. (Proposed Grade Hwy. 401 & 403)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURE	APPROACHES Longitudinal - 28' (Max.) Transverse - 17' (Max.)	
567± (557)	Glacial Till - Cohesive - Hard (7.5') Underlain by shale bedrock. (Refer to B.H. #19)	<p><u>PIERS:</u> Spread footings founded on or within the upper fractured portion of the shale bedrock using an allowable bearing pressure of up to 10.0 t.s.f.</p> <p><u>ABUTMENTS:</u> 'Perched' on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing value of 2.5 t.s.f. Alternatively, end-bearing piles driven to bedrock. - Estimated tip elevation 559 - designed for the max. allowable capacity for the pile section chosen.</p> <p><u>NOTE:</u> Differential settlements between spread footing supported abutments and adjacent piers will not exceed ½"</p>	<p><u>STABILITY:</u> Approaches up to 28' (with 2:1 slopes) will be stable. (F.S. ≥ 1.3)</p> <p><u>Probable Elastic Settlement</u> - 1" maximum.</p>	-----

6.6) Dixie Rd. - Hwy. #401 Complex:
Underpass and Ramp Dixie Rd. S.-E.
Structures

Pg. No.
27

FOUNDATION RECOMMENDATIONS

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6.6) Underpass Structure Dixie Rd - Hwy. #401
Ramp Dixie Rd. S.E. Structure

APPROX. EXISTING GROUND ELEV. (Proposed Grade Hwy. #401)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURES	APPROACHES Fill Heights - 25' (Max.)	
526.5 (526+)	<p>Glacial Till</p> <ul style="list-style-type: none"> - Cohesive - Very stiff to hard (21') <p>Silty sand with some gravel.</p> <ul style="list-style-type: none"> - Very dense (10') <p>Underlain by shale bedrock.</p> <p>(Refer to B.H. #21)</p>	<p><u>PIERS:</u></p> <p>Spread footings founded within glacial till, at or below elev. 522. Allowable bearing pressure 4 t.s.f.</p> <p><u>ABUTMENTS:</u></p> <p>'Perched' on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing pressure of 2.5 t.s.f. Alternatively, end-bearing piles driven to practical refusal in the silty sand deposit.</p> <ul style="list-style-type: none"> - Estimated tip elev. 500 to 502. - designed for the max. allowable capacity for the pile section chosen. <p><u>NOTE:</u> Differential settlements between spread footing supported abutments and adjacent piers will not exceed $\frac{1}{2}$"</p>	<p><u>STABILITY:</u></p> <p>25' Fills (with 2:1 slopes) will be stable (F.S. ≥ 1.3)</p> <p><u>Probable Elastic Settlement</u></p> <p>- 1" maximum.</p>	-----

6.7) Hwy. #401 - Airport West Entrance - Little Etobicoke Creek Complex:
(Nineteen Structures)

	<u>Crossing</u>	<u>Type</u>	<u>Page No.</u>
6.7.1)	Hwy. #401 - Airport Ramps	Overpasses (3)	29
6.7.2)	Hwy. #401 / Airport Ramps - Little Etobicoke Creek	Structures (7)	30
6.7.3)	Hwy. #401 - Airport Entrance	Overpasses (9)	31

FOUNDATION RECOMMENDATIONS
6.7.1) Overpass Structures (Three)
Hwy. #401 - Airport Ramps

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APPROX. EXISTING GROUND ELEV. (Proposed Grade Hwy. #401)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURE S	APPROACHES Fill Heights - 25' (Max.)	
519± (---)	<p>Glacial Till</p> <ul style="list-style-type: none"> - Cohesive - Hard <p>(26')</p> <p>Underlain by shale bedrock.</p> <p>(Refer to B.H. #24)</p>	<p><u>PIERS:</u></p> <p>Spread footings located within the glacial till. Allowable bearing pressure up to 5 t.s.f.</p> <p><u>ABUTMENTS:</u></p> <p>'Perched' on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing pressure of 2.5 t.s.f. Alternatively, end-bearing piles driven to practical refusal within the glacial till stratum.</p> <ul style="list-style-type: none"> - Estimated tip elev. 498 to 500 - designed for the max. allowable capacity of the pile section chosen. <p><u>NOTE:</u> Differential settlements between spread footing supported abutments and adjacent piers will not exceed ½".</p>	<p><u>STABILITY:</u></p> <p>Fills up to 25' (with 2:1 slopes) will be stable. (F.S. ≥ 1.3)</p> <p><u>Probable Elastic Settlement:</u></p> <p>25' Fills (2:1 slopes) - 1" maximum</p>	

FOUNDATION RECOMMENDATIONS

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6.7.2) Structures (Seven)

Hwy. #401 / Airport Ramps - Etobicoke Creek

APPROX. EXISTING GROUND ELEV. (Approx. Grade Hwy. #401)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURES - Single Span Rigid Frame	APPROACHES Fill Height - 28' (Max.)	
466 - Invert of creek. 499 - Top of creek bank. (Variable)	Glacial Till - Cohesive - Hard (50') Underlain by shale bedrock. (Refer to B.H. #23)	<u>CLOSED-TYPE ABUTMENTS:</u> Spread footings founded within cohesive glacial till deposit. Allowable bearing value up to 5.0 t.s.f. NOTE: Differential settlements between abutment foundations. - Negligible	<u>STABILITY:</u> Fills up to 28' (with 2:1 slopes) will be stable. (F.S. \geq 1.3) <u>Probable Elastic Settlement:</u> 28' Fills (2:1 slopes) - Negligible	The forward slopes will have to be protected against the scour action of the creek.

FOUNDATION RECOMMENDATIONS

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6.7.3) Overpass Structures (Nine) Hwy. #401 - Airport Entrance

APPROX. EXISTING GROUND ELEV. (Approx. Grade Hwy. #401)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	RECOMMENDATIONS		REMARKS
		STRUCTURES	APPROACHES	
509 (512+)	<p>Glacial Till</p> <ul style="list-style-type: none"> - Cohesive - Hard (21') <p>Silty Sand</p> <ul style="list-style-type: none"> - very dense. - (18') <p>Underlain by shale bedrock</p> <p>(Refer to B.H. #22)</p>	<p><u>PIERS:</u></p> <p>Spread footings founded within the silty sand deposit. Allowable bearing pressure up to 5.0 t.s.f.</p> <p><u>ABUTMENTS:</u></p> <p>Spread footings founded within the cohesive glacial till deposit. Allowable Bearing Pressure up to 5.0 t.s.f.</p> <p><u>NOTE:</u> Differential settlement between the spread footing supported piers and abutments should be negligible.</p>	<p><u>STABILITY:</u></p> <p>Approaches up to 22' (with 2:1 slopes) will be stable. (F.S. \geq 1.3)</p> <p><u>Probable Elastic Settlement:</u></p> <p>17' Fills (2:1 slopes)</p> <ul style="list-style-type: none"> - Negligible 	-----

6.8) Underpass Structure (Hwy. #401 and First Line Rd):

Pg. No.

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FOUNDATION RECOMMENDATIONS

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6.8) Underpass Structure
Hwy. #401 and First Line Rd.

RECOMMENDATIONS				
APPROX. EXISTING GROUND ELEV. (Proposed Grade Hwy. #401)	PREDOMINANT OVERBURDEN STRATA, APPROX. THICKNESS (FT.)	STRUCTURE	APPROACHES Fill Height - 23' (Max.)	REMARKS
630±	Glacial Till - Cohesive - Hard (11')	<u>PIERS:</u> Founded on spread footings located within the glacial till. Allowable bearing pressure up to 5.0 t.s.f.	<u>STABILITY:</u> Fills up to 23' (with 2:1 slopes) will be stable. (F.S. \geq 1.3)	
(630±)	Underlain by shale bedrock. (Refer to B.H. #12)	<u>ABUTMENTS:</u> 'Perched' on spread footings in the approach fills, within a zone composed of well compacted granular material, using an allowable bearing pressure of 2.5 t.s.f. Alternatively, end-bearing piles driven to bedrock. Estimated tip elev. 619. Designed for the max. capacity of the pile section chosen. <u>NOTE:</u> Differential settlements between spread footing supported abutments and adjacent piers will not exceed $\frac{1}{2}$ ".	<u>Probable Elastic Settlement</u> 23' Fills (2:1 slopes) - Negligible	-----

7. SUMMARY:

The subsurface and groundwater conditions, encountered within the area to be encompassed by the proposed Hwy.'s #401 - 403 - 410 complex, are generally favourable from a foundation point of view, when considering the interchange locations and the preliminary profile grades. The predominant stratum is a competent cohesive glacial till of variable thickness. Periodically, the till is underlain by a very dense silty sand deposit. The overburden is underlain by shale bedrock. At the majority of the structure crossings the following applies:

- i) Piers - founded on spread footings located in the glacial till or on bedrock, where bedrock protrudes within a few feet of ground surface.
- ii) Abutments - founded on spread footings 'perched' within the approach fills, or alternatively on end-bearing piles driven to practical refusal within the competent overburden or to bedrock.
- and iii) Approaches - of the heights contemplated (20 to 30 feet range) will be stable, provided standard 2:1 slopes are used. The settlement, induced in the foundation subsoil by the fill loadings, will be well within tolerable limits (generally 1 inch or less).

There are two major exceptions to this favourable pattern. These are listed below:

a) Artesian Head - Stations 1275 + 00 to 1290 + 00:

As discussed in Sub-Section 6.3.4) an artesian head exists in the lower granular deposit between Stations 1275 + 00 and 1290 + 00. The magnitude of this head was as much as 24 feet above existing ground surface. In this area Hwy. #403 was to be in a cut section, with the maximum depth being of the order of 11 feet. In order to prevent basal heave of the excavation base, due to this unbalanced artesian pressure head, we recommend that consideration be given to raising the grade of Hwy. #403 in this localized area.

and b) Swamp Crossing - Hwy. #403:

North of Base Line Rd., Hwy. #403 will cross the easterly leg of a swamp (refer to Sub-Section 6.4.2)). Indications are that the thickness

of the surficial organic material in this area is quite minimal (2 to 3 feet). It, therefore, can be completely sub-excavated and replaced with suitable granular material.

It should be stressed that the recommendations given in this report, are of a preliminary nature. A complete foundation investigation will be required at all the sites, once the alignment for the highways has been finalized and the design details become available.

8. MISCELLANEOUS:

The field work, performed during the period of April 9 to May 11, 1972, was carried out under the supervision of Mr. V. Korlu, Project Foundations Engineer.

The drilling equipment was owned and operated by Master Soil Investigation Ltd., Toronto.

This report was written by Mr. C. Poon, Project Foundations Engineer, and was assisted by Mr. B.T. Darch, Senior Foundations Engineer. The entire project was carried out under the general supervision of Mr. M. Devata, Supervising Foundations Engineer, who also reviewed the report.



C. Poon
C. Poon, P. Eng.

M. Devata
M. Devata, P. Eng.

CP/ht

July 18, 1972

APPENDIX I

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 72-11053

LOCATION Co-ords 842,584 N. 961,450 E.

ORIGINATED BY V.K.

W.P. 127-66-01

BORING DATE April 11, 1972

COMPILED BY A.T.

DATUM Geodetic

BOREHOLE TYPE Auger and Cone Test

CHECKED BY

[illegible]

FOUNDATION SECTION

ORIGINATED BY V.K.

COMPILED BY A.T.

CHECKED BY

BOREHOLE TYPE Auger and Cone Test

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT 20 40 60 80 100	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE	WATER CONTENT % 10 20 30			
525.4	Ground level.											
0.0	Fill material (Silty sa. to clayey si. with sa. & gravel)		1	SS	23							
520.4												
5.0	Clayey si. with sand & gra. (Glacial Till)		2	SS	100/1"	520						
517.9												
7.5	Bedrock - Interbedded limestone & shale. Sound.		3	BXL RC	Rec 65%							
513.4												
12.0	Shale with occ. bands of limestone. Sound		4	BXL RC	Rec 100%	510						
509.9												
15.5	End of borehole.											
						500						

FOUNDATION SECTION

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT _____	LIQUID LIMIT ———— w _L PLASTIC LIMIT ———— w _p WATER CONTENT ———— w	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	SITING PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE	w _p w w _L WATER CONTENT %		
530.0	Ground level.					530				
528.2	Glacial Till.									
1.8	End of borehole. Probable Bedrock.					520				

FOUNDATION SECTION

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SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — w_L		BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAI. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT		PLASTIC LIMIT — w_p				WATER CONTENT — w
							20	40	60	80			
							SHEAR STRENGTH P.S.F.		WATER CONTENT %				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		w_p — w — w_L				
0.0	Ground level.												
0.0	Clayey silt with some sand & gravel. (Glacial Till.)		1	SS	30								
480.9	Very stiff to hard.		2	SS	70								
9.0	Weathered Bedrock - Limestone & shale. Sound.		3	SS	100	4" 480							
476.6			4	BX RC	Rec 50%								
13.3	End of borehole.					470							

CHECKED BY [Signature]

[illegible]

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
DESIGN SERVICES BRANCH


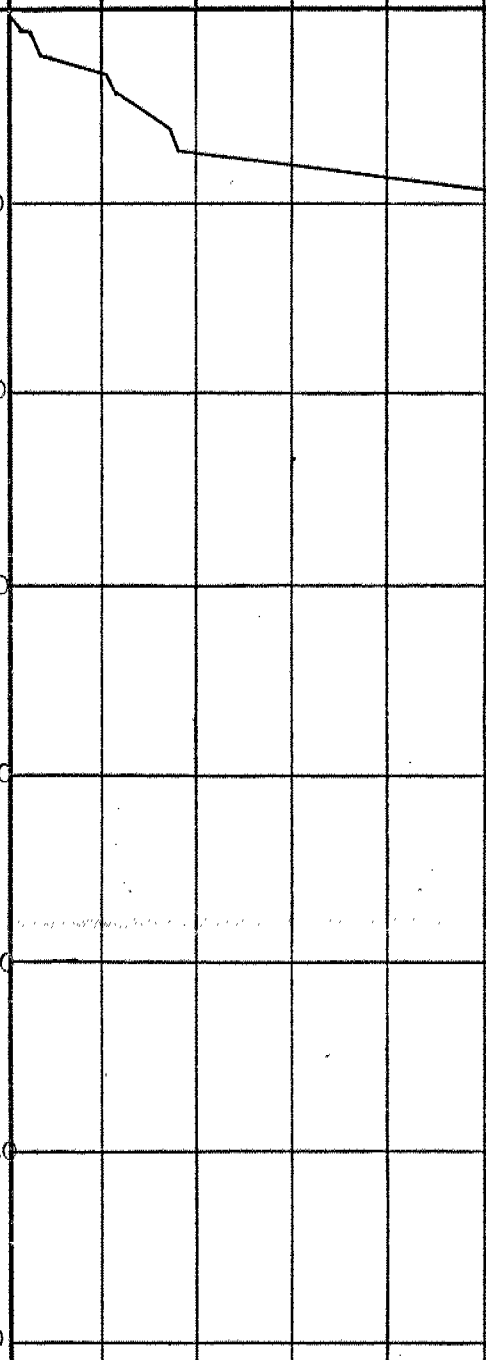
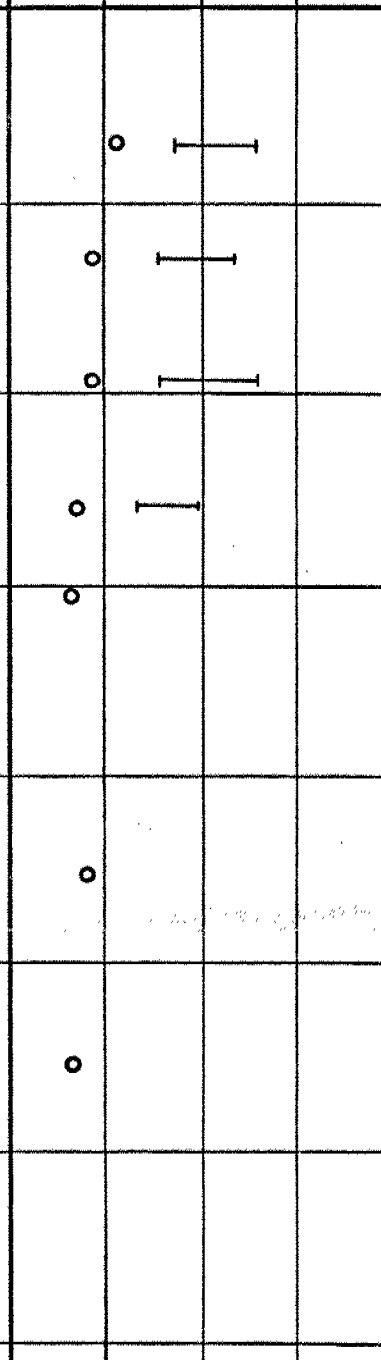


RECORD OF BOREHOLE No.3

FOUNDATION SECTION

JOB 72-11053 LOCATION Co-ord's 847,773 N. 965,805 E. ORIGINATED BY V.K.

W.P. 127-66-01 BORING DATE April 13, 1972 COMPILED BY A.T.

DATUM Geodetic BOREHOLE TYPE Auger and Cone Test CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT 20 40 60 80 100					WATER CONTENT % w_p w w_L				
							SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE									
4.89	Ground level.														GR. SA. SI. CL.	
0.0	Brown Grey Clayey silt with some sand and gravel. (Glacial Till) Hard		1	SS	31	480									W.L. El. 479.9 4 25 56 15	
			2	SS	39											
			3	SS	53											
			4	SS	86											
			5	SS	48											
			6	SS	124											
			7	SS	70											
464.9	Silty sand, occasional clayey silt layers and boulders. Very dense.		8	SS	100/5"	460									3 54 34 9 8 56 30 6 8 40 41 11 18 41 33 8	
25.0			9	SS	100/6"											
			10	SS	100/4"											
			11	SS	100/6"											
			12	SS	100/4"											
			13	SS	100/6"											
			14	SS	100/3"											
428.9			15	SS	100/3"											
61.0	Bedrock - Dark grey shale.					420										
418.1			16	BXL RC	Rec 77%											
71.5	End of borehole.															

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No.4

FOUNDATION SECTION

JOB 72-11053
W.P. 127-66-01
DATUM Geodetic

LOCATION Co-Ord's 848,110 N. 965,549 E.
BORING DATE April 14, 1972
BOREHOLE TYPE Auger and Cone Test

ORIGINATED BY V.K.
COMPILED BY A.T.
CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w			BULK DENSITY γ P.C.F.	REMARKS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					SHEAR STRENGTH P.S.F.					WATER CONTENT %																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
							20	40	60	80	100	○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					w_p	w	w_L	10	20	30																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
491.4	Ground level.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	</

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No.5

FOUNDATION SECTION

JOB 72-11053

LOCATION Co-ord's 847,550 N. 965,252 E.

ORIGINATED BY V.K.

W.P. 127-66-01

BORING DATE May 1, 1972

COMPILED BY A.T.

DATUM Geodetic

BOREHOLE TYPE Auger and Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	w_p	w	w_L		
189.2	Ground level															
0.0			1	SS	16											
			2	SS	105/6"	480										
	Brown Grey		3	SS	100/4"											
	Clayey silt with some sand and gravel. (Glacial Till)		4	SS	110											
			5	SS	100											
	Very stiff to hard.		6	SS	105/6"	470										
			7	SS	110/6"											
			8	SS	100/5"	460										
			9	SS	100/3"											
	Silty sand.		10	SS	94											
			11	SS	100/1"	450										
438.2			12	SS	100/1"	440										
51.0	Bedrock - Dark grey shale with occasional limestone bands. Sound.		13	BX RC	100%											
432.2			14	RX RC	100%											
57.0	End of borehole.															

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No6

FOUNDATION SECTION

JOB 72-11053

LOCATION Co-Ord's 848,875 N. 964,734 E.

ORIGINATED BY V.K.

W.P. 127-66-01

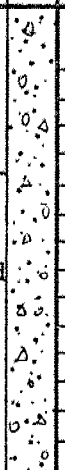


BORING DATE April 14, 1972

COMPILED BY C.S.P.

DATUM Geodetic

BOREHOLE TYPE Auger and Dynamic Penetration Test

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS			
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	w_p	w	w_L		GR.	SA.	SI.	CL.
497.4	Ground level.																		
0.0	Brown Grey Clayey silt with sand and gravel. (Glacial Till) Hard.		1	SS	35	490													
			2	SS	99														
			3	SS	78														
			4	SS	36	480													
			5	SS	28														
			6	SS	17														
			7	SS	102														
472.4	Silty sand with gravel and trace of clay. Very dense.		8	SS	82	470													
25.0			9	SS	100/6"														
			10	SS	100/6"														
			11	SS	116	460													
			12	SS	97/6"	450													
436.9	End of borehole.		13	SS	100/5"	440													
60.5						430													

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No.7

FOUNDATION SECTION

JOB 72-11053

LOCATION Co-ord's 850,010 N. 963,879 E.

ORIGINATED BY V.K.

W.P. 127-66-01

BORING DATE April 17, 1972

COMPILED BY C.S.P.

DATUM Geodetic

BOREHOLE TYPE Auger and Dynamic Penetration Test

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	w_p	w	w_L		
497.3	Ground level.															
0.0	Fill material-(Clayey silt with sand & gravel Trace of organics)		1	SS	21											Tip El. 489.3
491.3	Soft to stiff.		2	SS	70	490										2 54 39 5
6.0	Brown Grey Clayey silt with sand & gravel. (Glacial Till) Hard to stiff.		3	SS	119											Tip El. 480.3
			4	SS	117											
			5	SS	29	480										W.L. El. 480.3
			6	SS	15											8 39 43 10
			7	SS	13											
	Silty sand		8	SS	4	470										6 68 16 10
			9	SS	103											
			10	SS	100/6"	460										19 40 35 6
457.3			11	SS	115											
40.0	Silty sand and gravel changing to sand and silt.		12	SS	100/6"	450										2 30 58 10
	Very dense.		13	SS	100/6"	440										
						430										
						420										
						410										
						400										

(To be continued)

395.3
102.0

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No.7(Cont)

FOUNDATION SECTION

JOB 72-11053 LOCATION Co-ord's 850,010 N. 963,879 E. ORIGINATED BY V.K.
 W.P. 127-66-01 BORING DATE April 17, 1972 COMPILED BY C.S.P.
 DATUM Geodetic BOREHOLE TYPE Auger and Dynamic Penetration Test CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					PLASTIC LIMIT — w_p				
												WATER CONTENT — w				
SHEAR STRENGTH P.S.F.												WATER CONTENT %				
○ UNCONFINED + FIELD VANE												w_p — w — w_L				
● QUICK TRIAXIAL x LAB. VANE												10 20 30				
395.3	⚡					390										
102.0	⚡															
383.3																
114.0	End of borehole.					380										

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No.8

FOUNDATION SECTION

JOB 72-11053

LOCATION Co-ord's 849,750 E. 963,598 E.

ORIGINATED BY V.K.

W.P. 127-66-01

BORING DATE April 18, 1972

COMPILED BY C.S.P.

DATUM Geodetic

BOREHOLE TYPE Auger and Dynamic Penetration Test

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.					WATER CONTENT %				
						20 40 60 80 100					w_p — w — w_L					
						<input type="radio"/> UNCONFINED + FIELD VANE <input checked="" type="radio"/> QUICK TRIAXIAL x LAB. VANE										
499.0	Ground level.															
0.0	Fill material (Clayey si. with sa. & gravel)															
494.0	Soft to firm.		1	SS	7											
5.0			2	SS	68											
	Brown		3	SS	88	490										
	Grey		4	SS	65											
	Clayey silt with sand and gravel.		5	SS	62											
	(Glacial Till)		6	SS	110	480										
	Hard.		7	SS	100/3"											
474.0			8	SS	100/3"											
25.0	Sandy silt to silty sand with gravel, trace of clay.		9	SS	40	470										
	Dense to very dense.		10	SS	100/6"											
459.0						460										
40.0	Silty fine sand and gravel.		11	SS	23											
	Compact to very dense.		12	SS	100/6"	450										
	With boulders below elevation 439.		13	SS	100/4"	440										
						430										
						420										
						410										
						400										

(To be continued)

397.0
102.0

20
15-5 % STRAIN AT FAILURE
10

RECORD OF BOREHOLE No.8 (Cont.)

JOB _____ LOCATION _____ ORIGINATED BY V.K.
 W.P. _____ BORING DATE _____ COMPILED BY C.S.P.
 DATUM _____ BOREHOLE TYPE _____ CHECKED BY JP.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE						LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.						WATER CONTENT %				
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE						w_p — w — w_L					
397.0	1																
102.0																	
						390											
						380											
374.0																	
125.0	End of borehole.					370											

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No. 9

FOUNDATION SECTION

JOB 72-11053

LOCATION Co-ord's 850,325 N. 963,342 E.

ORIGINATED BY V.K.

W.P. 127-66-01

BORING DATE May 4, 1972

COMPILED BY C.S.P.

DATUM Geodetic

BOREHOLE TYPE Auger and Dynamic Penetration Test

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	WATER CONTENT % w_p — w — w_L				
502.3	Ground level.															
0.0																
	Brown.		1	SS	58	500										
	Grey.		2	SS	61											
	Clayey silt, with some sand, trace of gravel.		3	SS	59											
	(Glacial Till)		4	SS	38	490										
	Very stiff to hard.		5	SS	28											
			6	SS	30											
			7	SS	54	480										
			8	SS	33											
474.3																
28.0	Silty sand, trace of gravel.		9	SS	32	470										
	Dense to very dense.		10	SS	103											
			11	SS	52	460										
						450										
						440										
						430										
						420										
						410										
400.3																
102.0																

(To be continued)

RECORD OF BOREHOLE No. 9 (Cont.)

FOUNDATION SECTION

JOB _____ LOCATION _____ ORIGINATED BY V.K.
 W.P. _____ BORING DATE _____ COMPILED BY C.S.P.
 DATUM _____ BOREHOLE TYPE _____ CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE						LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.						WATER CONTENT %				
100.3						400											
102.0																	
						390											
						380											
						370											
365.8																	
136.5	End of borehole. Probably bedrock.					360											

CHECKED BY

RECORD OF BOREHOLE No.10

[illegible]

CHECKED BY RL.

FOUNDATION SECTION

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT		WATER CONTENT			
							SHEAR STRENGTH P.S.F.		WATER CONTENT %			
						20 40 60 80 100		W _L — W _P — W —		P.C.F.		
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		W _P — W — W _L		GR. SA. SI. CL.		
630.5	Ground level.					630						
0.0	Clayey si. with some sand & gravel. (Glacial Till) Hard. Brown.		1	SS	49							
624.5			2	SS	100/6"							
6.0	Weathered shale and clayey silt.		3	SS	100/4"							
619.5			4	RC BXL	50% Rec	620						
11.0	Bedrock - Red shale with thin beds of sandstone and limestone. Sound.		5	RC BX	100% Rec							
611.5												
19.0	End of borehole.					610						

CHECKED BY [Signature]

FOUNDATION SECTION

[illegible]

FOUNDATION SECTION

CHECKED BY _____

[illegible]

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No.15

FOUNDATION SECTION

JOB 72-11053 LOCATION Co-Ord's 856,425 N. 957,761 E. ORIGINATED BY V.K.
W.P. 127-66-01 BORING DATE April 21, 1972 COMPILED BY A.T.
DATUM Geodetic BOREHOLE TYPE Auger and Cone Test CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS			
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					SHEAR STRENGTH P.S.F.					WATER CONTENT %		
							20	40	60	80	100	+ FIELD VANE x LAB. VANE					w_p	w	w_L
602.9	Ground level.																		
0.0	Brown clayey silt, some sand, some gravel (Glacial Till)		1	SS	38	600										5 23 45 27			
595.4	Hard.		2	SS	46														
7.5	Bedrock - weathered interbedded limestone and shale.		3	BX RC	Rec 60%	590													
590.4	Sound interbedded shale and limestone.		4	BX RC	Rec 100%														
12.5			5	BX RC	Rec 100%														
583.4																			
19.5	End of borehole.					580													

FOUNDATION SECTION

CHECKED BY et

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w_L		BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT		PLASTIC LIMIT ——— w_p				
							20	40	60	80			100
							SHEAR STRENGTH P.S.F.		WATER CONTENT %				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		w_p ——— w ——— w_L				
									10 20 30				
604.3	Ground level.												
0.0	Clayey silt with some sand, and gravel. (Glacial Till) Hard.		1	SS	39	600						13 27 36 24	
			2	SS	110/6"								
			3	SS	100/3"								
591.3			4	SS	110/6"								
13.0	Bedrock <u>Weathered</u>		5	BX RC	Rec 80%	590							
			6	BX-RC	67%								
582.8	Dark grey shale with minor limestone bands Sound		7	BX RC	Rec 77%								
21.5	End of borehole.					580							

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No.17

FOUNDATION SECTION

JOB 72-11053 LOCATION Co-ord's 856,944 N. 958,695 E.

ORIGINATED BY V.K.

W.P. 127-66-01

BORING DATE April 24, 1972

COMPILED BY A.T.

DATUM Geodetic

BOREHOLE TYPE Auger and Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — w_L		BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT 20 40 60 80 100	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT — w_p	WATER CONTENT — w		
592.5	Ground level.											
0.0	Brown-grey clayey silt with some sand and gravel. (Glacial Till). Hard.		1	SS	39	590						
583.5			2	SS	57							
9.0	Bedrock-interbedded shale and limestone bands		3	BX RC	Rec 88%	580						
574.5			4	BX RC	Rec 90%							
18.0	End of borehole.					570						

FOUNDATION SECTION

CHECKED BY SP.

[illegible]

FOUNDATION SECTION

CHECKED BY

[illegible]

CHECKED BY 

FOUNDATION SECTION

[illegible]

RECORD OF BOREHOLE No.21

[illegible]

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No.22

FOUNDATION SECTION

JOB 72-11053

LOCATION Co-ord's 861,434 N. 966,550 E.

ORIGINATED BY V.K.

W.P. 127-66-01

BORING DATE April 26, 1972

COMPILED BY A.T.

DATUM Geodetic

BOREHOLE TYPE Auger and Cone Test

CHECKED BY *SP*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. LOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	20	40	60	80	100	W _P	W			W _L
509.0	Ground level																
0.0	Clayey silt with some sand and gravel. (Glacial Till)		1	SS	61	500											
			2	SS	61												
			3	SS	72												
			4	SS	26												
			5	SS	93												
			6	SS	100/3"												
488.0			7	SS	100/4"	480											
			8	SS	120												
			9	SS	107/6"												
			10	SS	100/4"												
470.0						470											
39.0	Bedrock - Dark grey shale with minor limestone bands.		11	BX RC	100%												
426.5			12	BX-RC	100%												
45.5	End of borehole.					460											

0 1 83 16
W.L. El.
499.0

14 45 32 9
12,52 30 6

32 46 17 5

2 10 74 14

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No.23

FOUNDATION SECTION

JOB 72-11053

LOCATION Co-ord's 862,305 N. 967,267 E.

ORIGINATED BY V.K.

W.P. 127-66-01

BORING DATE April 25, 1972

COMPILED BY A.T.

DATUM Geodetic

BOREHOLE TYPE Auger and Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	w_p	w	w_L		
506.6	Ground level.															
0.0	Clayey silt with some sand and gravel. (Glacial Till)		1	SS	43	500										3 28 49 20 W.L. El. 489.6 8 37 41 14 8 42 38 12
			2	SS	55											
			3	SS	115											
			4	SS	112											
			5	SS	100/4"											
			6	SS	100/3"											
			7	SS	117/6"											
			8	SS	100/3"											
			9	SS	120/6"											
			10	SS	100/3"											
			11	SS	100/5"											
456.6			12	SS	100/1"	460										
50.0	Bedrock-shale with minor bands of badly fractured limestone.		13	BX-RC	30%	450										
452.6			14	BX-RC	60%											
54.0	Shale with occ. thin bands of limestone, sandstone.															
445.1																
61.5	End of borehole.					440										

CHECKED BY

W.L. @ EL.
500.0

JOB	<u>72-11053</u>	LOCATION	<u>Co-ord's 842,170 N. 961,095 E.</u>	ORIGINATED BY	<u>V.K.</u>
W.P.	<u>127-66-01 45</u>	BORING DATE	<u>May 8-9, 1972</u>	COMPILED BY	<u>A.T.</u>
DATUM	<u>Geodetic</u>	BOREHOLE TYPE	<u>Auger</u>	CHECKED BY	<u>BP.</u>

[illegible]

31

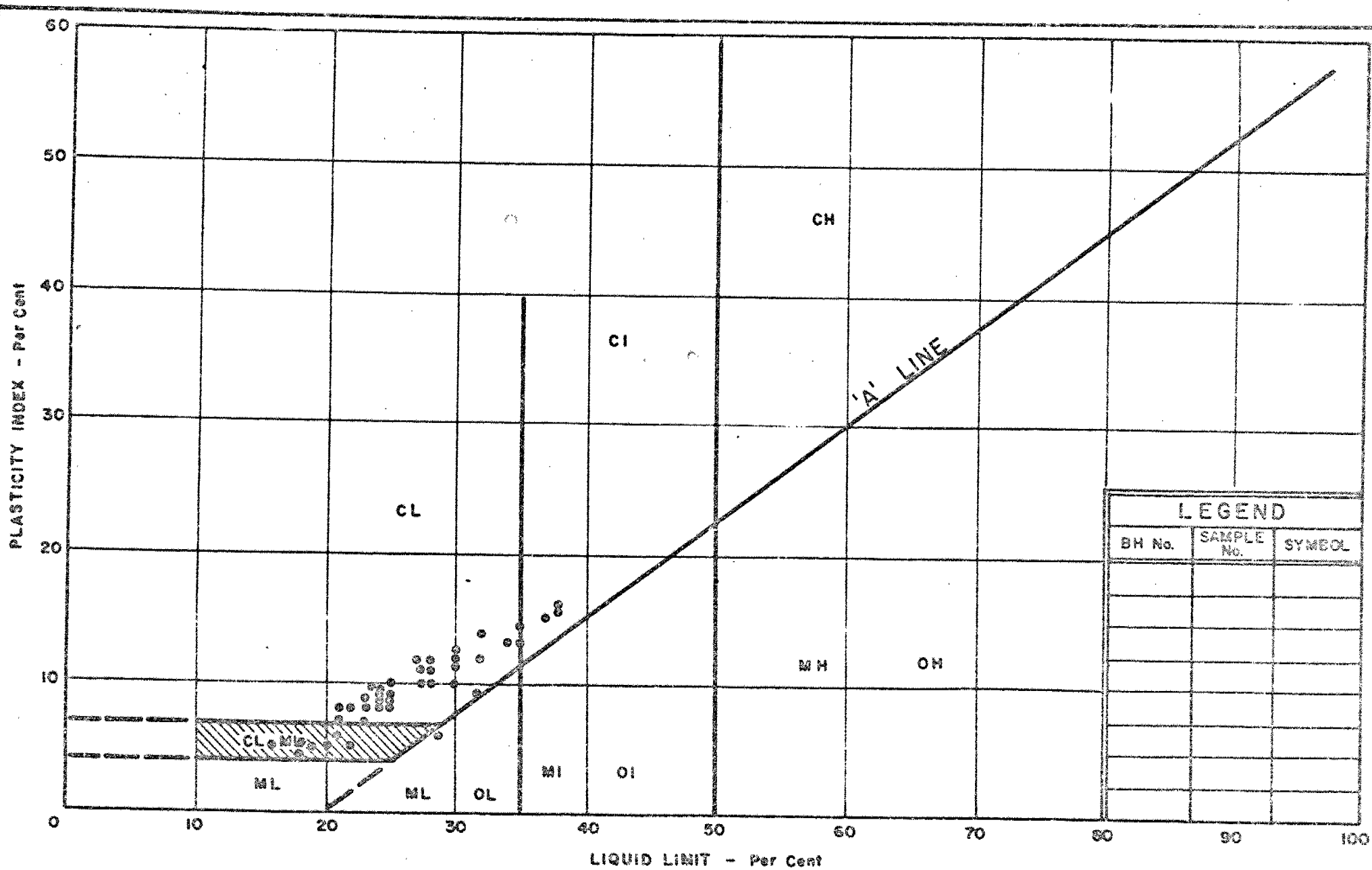
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SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— w _L PLASTIC LIMIT ——— w _p WATER CONTENT —— w		BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.	w _p w _L WATER CONTENT %			
521.9	Ground level.									P.C.F.	GR. SA. SI. CL.
0.0	Brown silty clay, some sa., trace of gravel.		1	SS	60%	520					▼ W.L. @ El. 518.7
518.9			2	BX-RC	70%						
3.0	Bedrock-limestone - Weathered with bands of shale. Sound.		3	BX RC	79%						
513.4											
8.5	End of borehole.					510					

CHECKED BY

[illegible]



PLASTICITY CHART

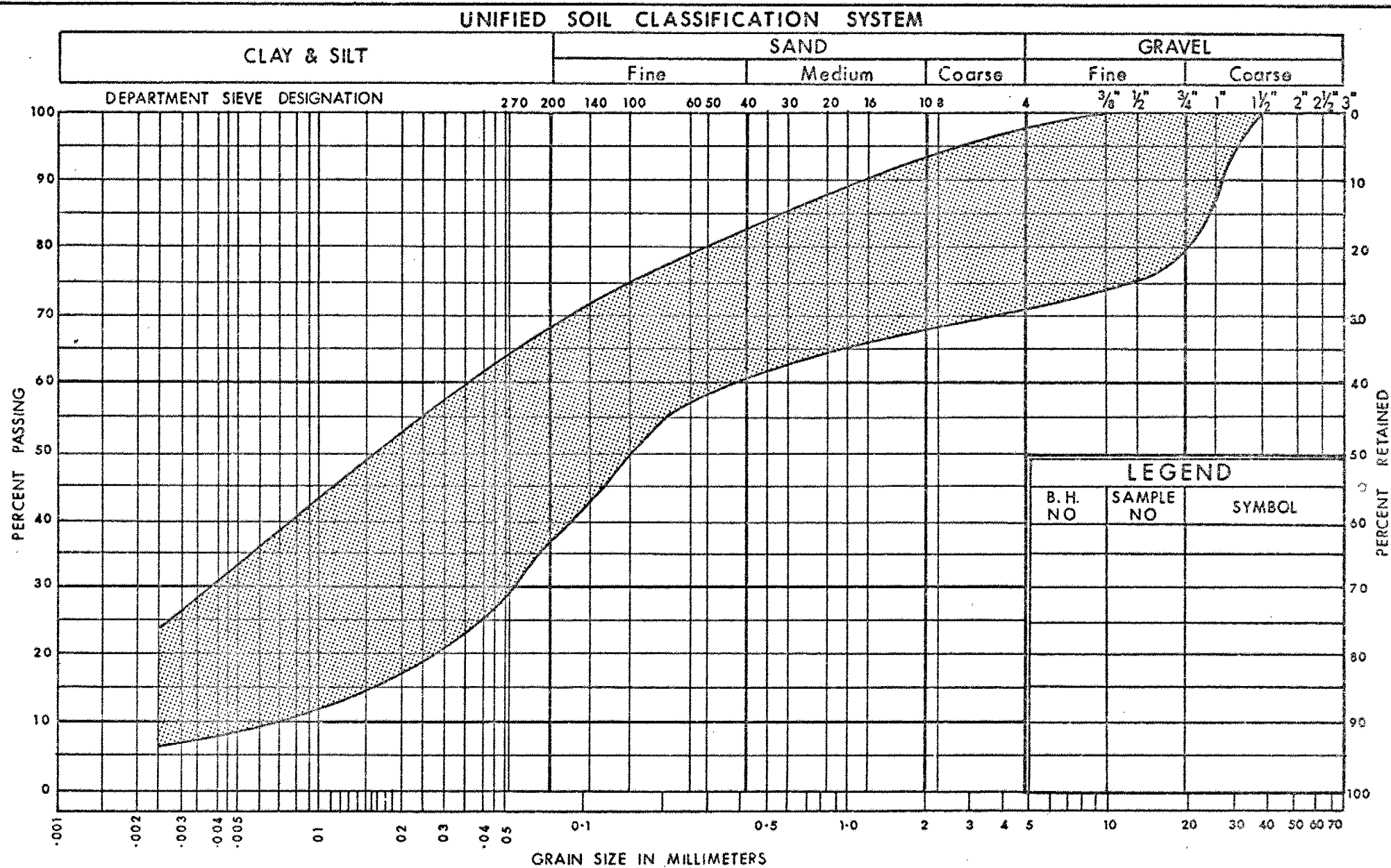
GLACIAL TILL

HET. MIXTURE OF CLAYEY SILT, SAND & GRAVEL

W.F. No. . 127-66-01

JOB No. 72 - 11053

FIG. 1



ONTARIO

DESIGN SERVICES
BRANCH

GRAIN SIZE DISTRIBUTION

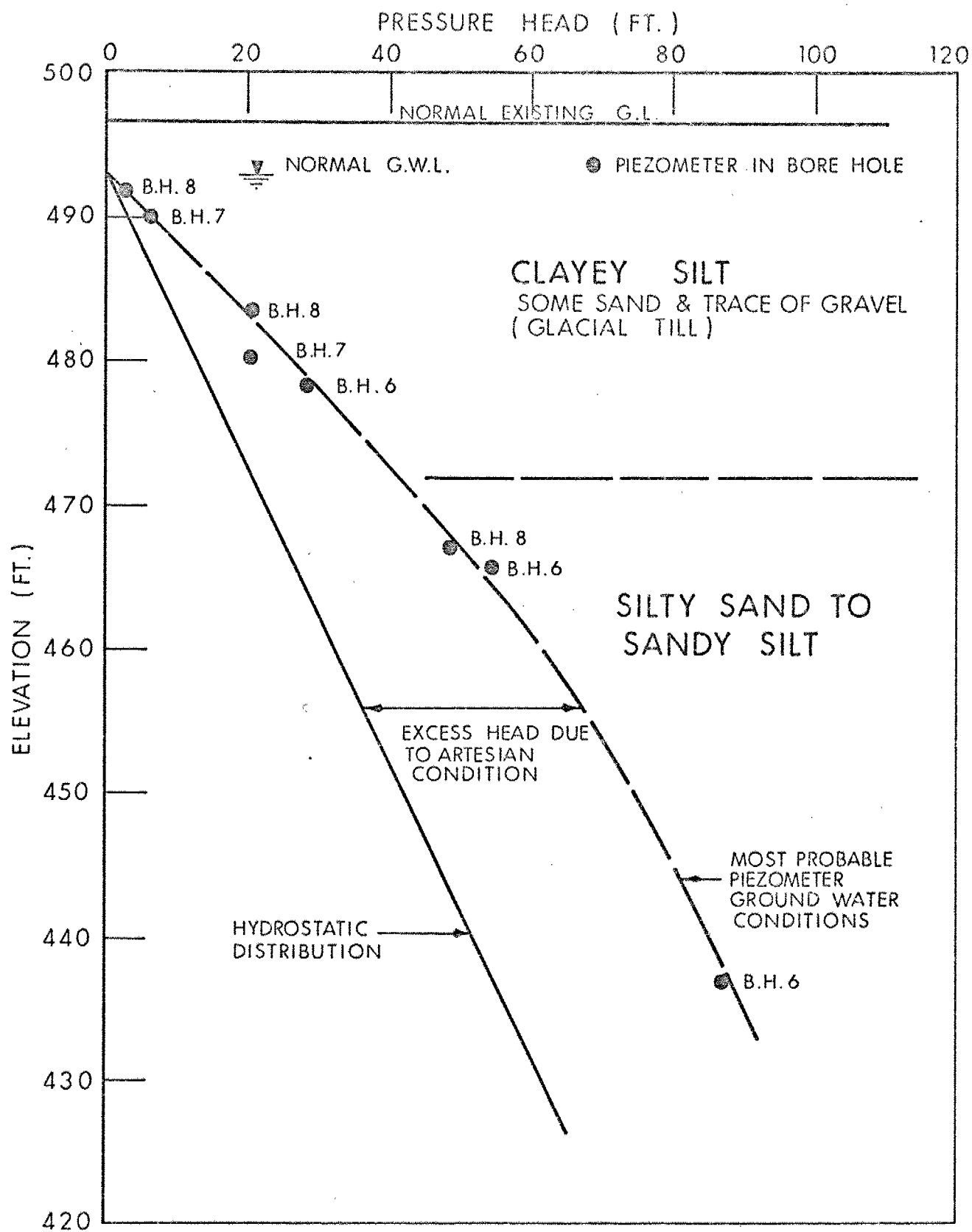
GLACIAL TILL

HET. MIXTURE OF CLAYEY SILT, SAND & GRAVEL

W.P. No. 127-66-01

JOB No. 72 - 11053

FIG. 2



GROUNDWATER REGIME - BASE LINE ROAD
& CAWTHRA ROAD AREA (STA. 1275 to 1290)

FIG. 4

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_c	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' :- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE :- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS :-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

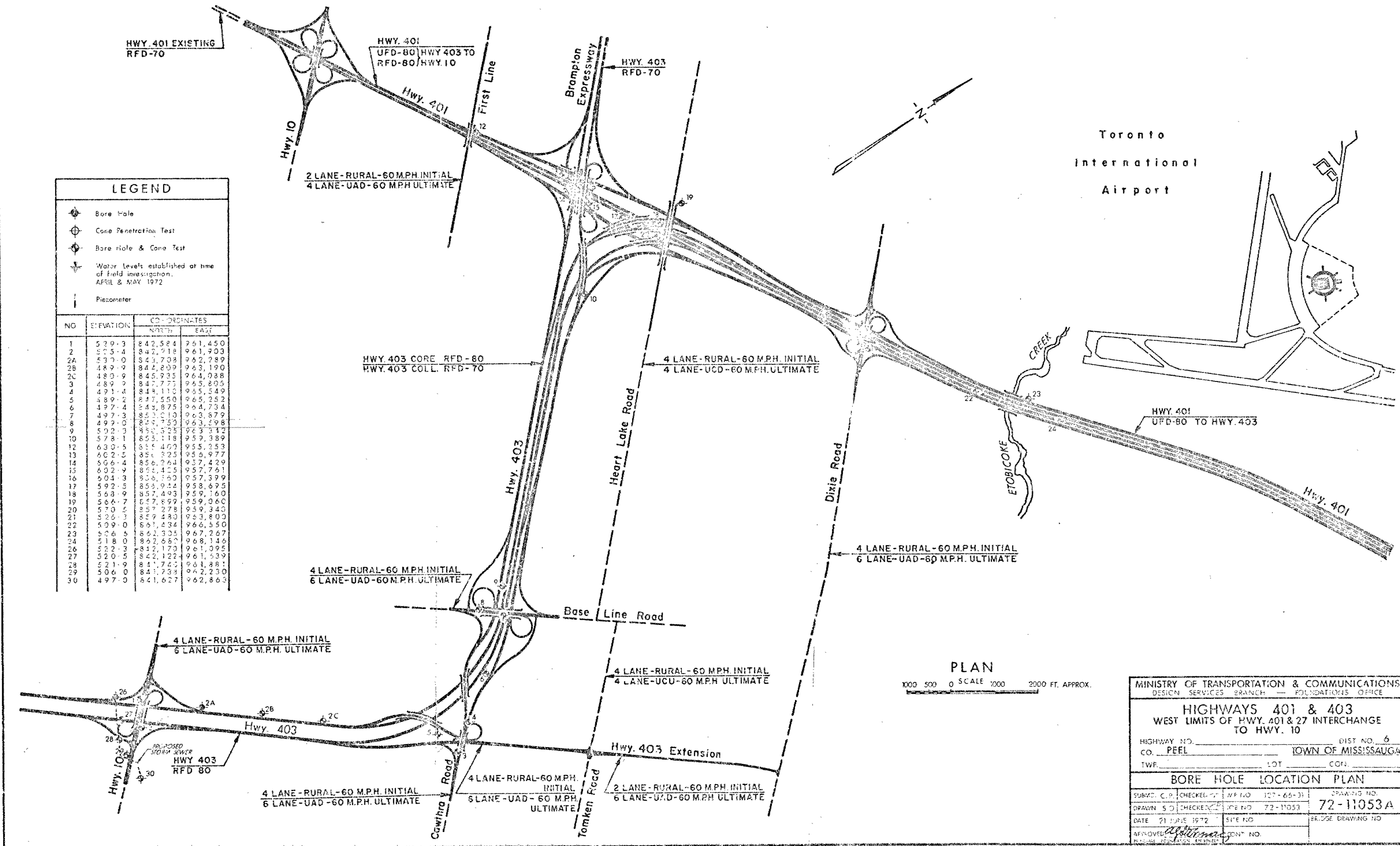
TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

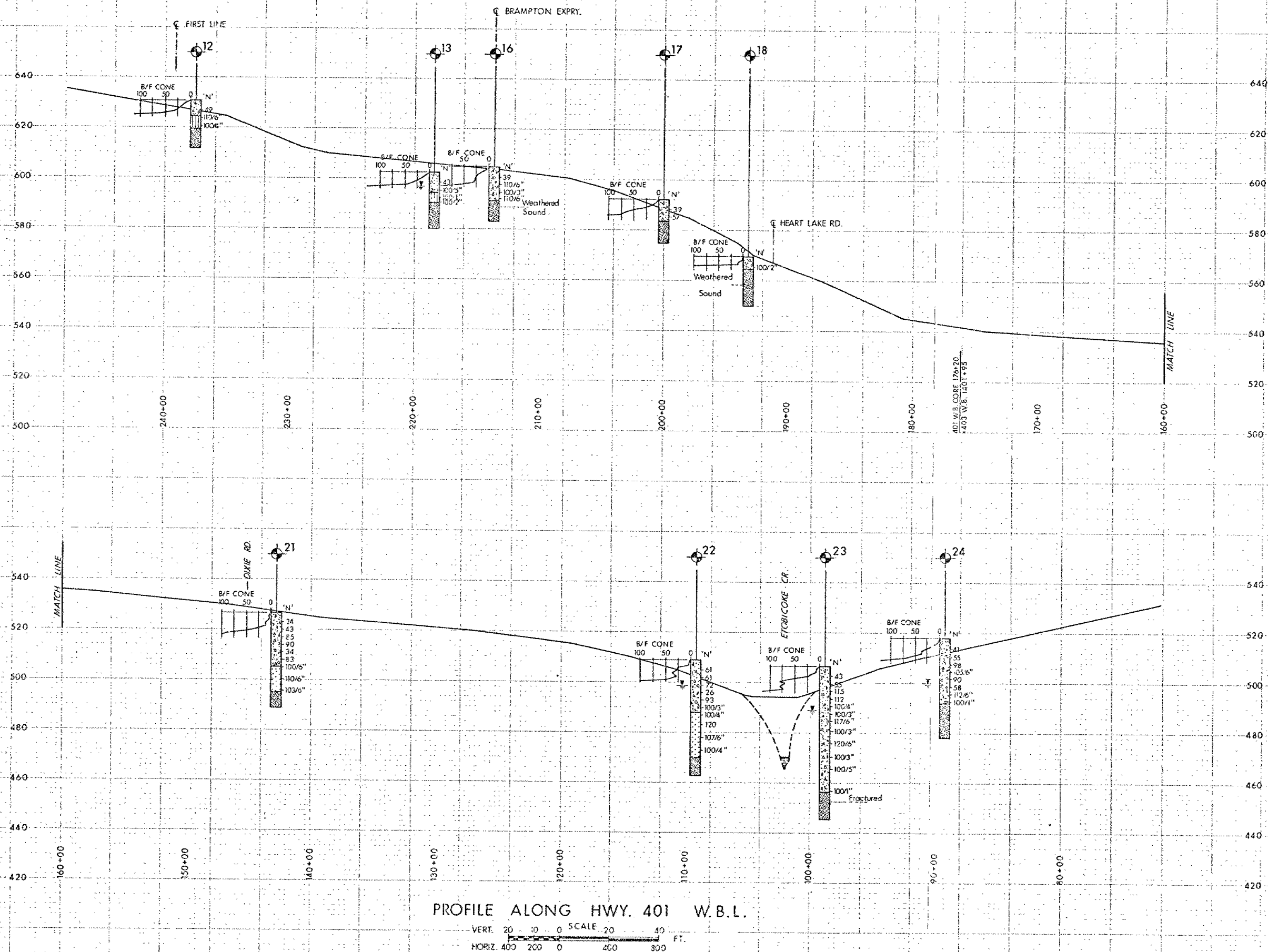
Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

LEGEND			
	Bore Hole		
	Cone Penetration Test		
	Bore hole & Cone Test		
	Water Levels established at time of field investigation. APRIL & MAY 1972		
	Piezometer		
NO	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	529.3	842,584	961,450
2	525.4	842,718	961,903
2A	537.0	843,708	962,289
2B	489.9	842,209	963,190
2C	480.9	845,935	964,088
3	489.9	847,773	965,805
4	491.4	848,110	965,549
5	489.2	847,550	965,252
6	497.4	848,875	964,734
7	497.3	852,210	963,879
8	499.0	849,750	963,598
9	502.3	850,525	963,342
10	578.1	855,118	957,389
12	630.5	855,462	955,253
13	602.5	856,325	955,977
14	506.4	856,264	957,429
15	602.9	856,425	957,761
16	604.3	856,560	957,399
17	592.5	855,924	958,695
18	568.9	857,403	959,160
19	566.7	857,899	959,060
20	570.5	857,278	959,340
21	526.3	859,430	963,800
22	509.0	861,434	966,550
23	526.6	862,305	967,267
24	518.0	862,652	968,146
26	522.3	862,170	961,095
27	520.5	862,122	961,539
28	521.9	861,760	961,881
29	506.0	861,733	962,230
30	497.0	861,627	962,863

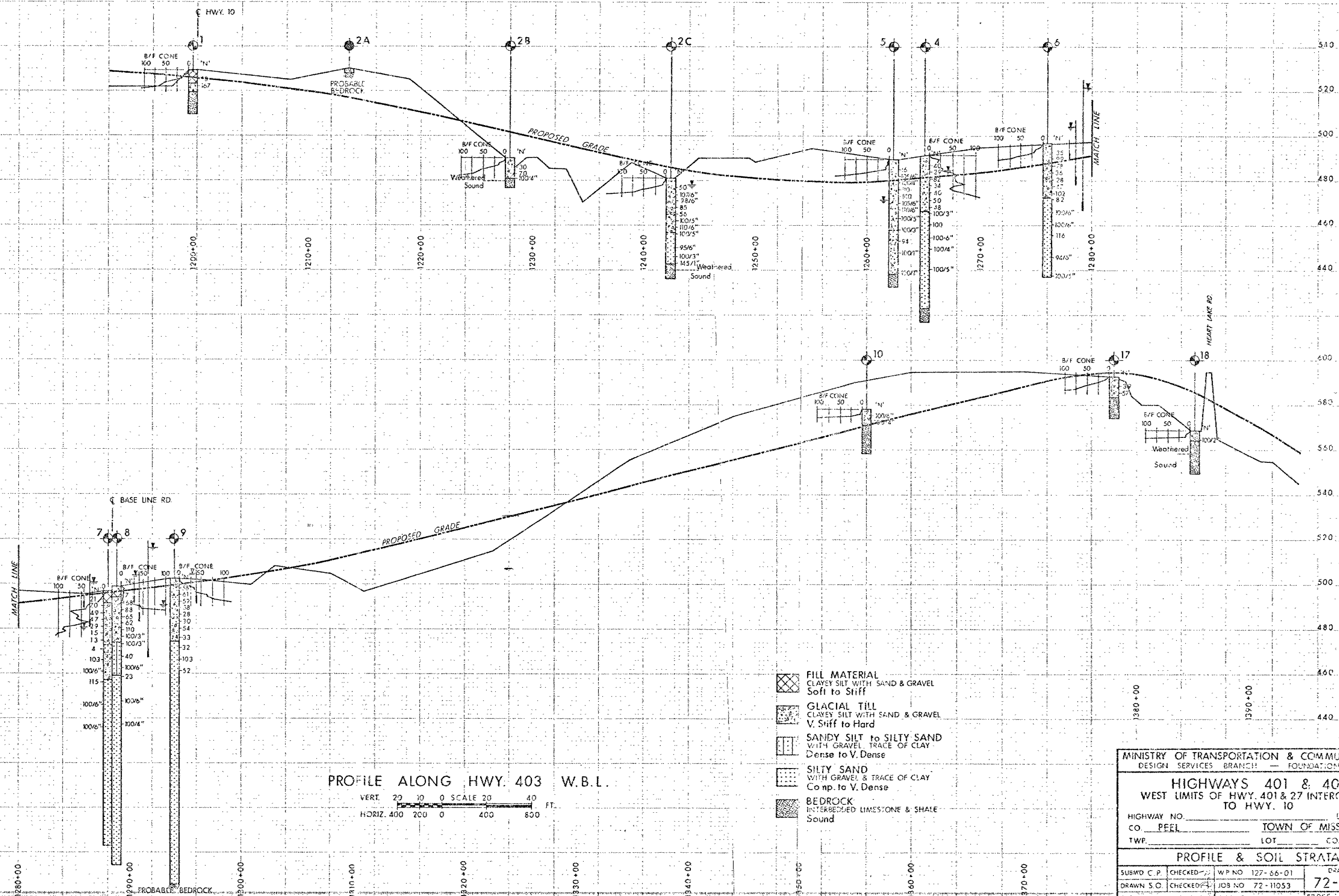


PLAN
 1000 500 0 SCALE 1000 2000 FT. APPROX.

MINISTRY OF TRANSPORTATION & COMMUNICATIONS			
DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE			
HIGHWAYS 401 & 403			
WEST LIMITS OF HWY. 401 & 27 INTERCHANGE TO HWY. 10			
HIGHWAY NO. _____		DIST NO. 6	
CO. PEEL		TOWN OF MISSISSAUGA	
TWP. _____		LOT _____ CON. _____	
BORE HOLE LOCATION PLAN			
SUBMIT. C.P.	CHECKED C.P.	DATE 127-66-31	DRAWING NO.
DRAWN 50	CHECKED 50	DATE 72-11053	72-11053A
DATE 21 JUNE 1972	SITE NO.	BRIDGE DRAWING NO.	
APPROVED <i>[Signature]</i> DATE NO.			



MINISTRY OF TRANSPORTATION & COMMUNICATIONS DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE			
HIGHWAYS 401 & 403 WEST LIMITS OF HWY. 401 & 27 INTERCHANGE TO HWY. 10			
HIGHWAY NO. _____	DIST NO. <u>6</u>		
CO. <u>PEEL</u>	TOWN OF <u>MISSISSAUGA</u>		
TWP. _____	LOT _____	CON. _____	
PROFILE & SOIL STRATA			
SUBWD. C.P. CHECKED <input checked="" type="checkbox"/>	APP. NO. <u>127-66-01</u>	DRAWING NO.	
DRAWN S.O. CHECKED <input checked="" type="checkbox"/>	JOB NO. <u>72-11053</u>	72-11053 C	
DATE <u>27 JUNE 1972</u>	SITE NO. _____	BRIDGE DRAWING NO. _____	
APPROVED <i>[Signature]</i>	CONT. NO. _____	PRINCIPAL FOUNDATION ENGINEER	



MINISTRY OF TRANSPORTATION & COMMUNICATIONS DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE			
HIGHWAYS 401 & 403 WEST LIMITS OF HWY. 401 & 27 INTERCHANGE TO HWY. 10			
HIGHWAY NO. _____	DIST NO. <u>6</u>		
CO. <u>PEEL</u>	TOWN OF <u>MISSISSAUGA</u>		
TWP. _____	LOT _____	CON. _____	
PROFILE & SOIL STRATA			
SUBMD C.P. _____	CHECKED <u>✓</u>	WP NO. <u>127-66-01</u>	DRAWING NO. _____
DRAWN S.O. _____	CHECKED <u>✓</u>	JOB NO. <u>72-11053</u>	72-11053B
DATE <u>26 JUNE 1972</u>	S'VE NO. _____		BRIDGE DRAWING NO. _____
APPROVED <u>[Signature]</u> CONT. NO. _____			

APPENDIX II

MEMORANDUM

To: Mr. M. Devata,
Supervising Foundations Engineer,
Foundations Office,
1st Floor, West Building.
ATTENTION:

From: Soils Office,
Design Services Branch,
1st Floor, West Building.

DATE: June 22, 1972.

OUR FILE REF.

IN REPLY TO

SUBJECT:


Terrain Analysis
Interchange 403 & 401 Complex

Further to your telephone request of June 5, 1972 attached is a report for your information.

The above area was evaluated using aerial photographs at a scale of 1" = 1,320'. These photographs were flown last year by the Ministry of Natural Resources.

The proposed location of Highway 403 looks good and no major geotechnical problems are anticipated.

Please feel free to let us know if we can be of any further assistance in this matter.


B. Sen Mathur,
Airphoto Interpretation Engineer.

BSM/go
Attached

TERRAIN ANALYSIS
INTERCHANGE 403 & 401 COMPLEX

TERRAIN ANALYSIS

INTERCHANGE 403 & 401 COMPLEX

LOCATION:

The study area lies in the County of Peel and can be referred to on the Brampton E 1/2 Militia Sheet (Map 1).

TOPOGRAPHY:

The topography of the area is slightly irregular. This is caused by the dissection of the interlobate moraine by the Etobicoke Creek and its tributaries.

BEDROCK GEOLOGY:

The underlying bedrock in the area largely consists of shales of Paleozoic formations. There are no outcrops visible in the study area but the depth to bedrock seems to vary from shallow (<5-10') to deep (>20').

SURFICIAL DEPOSITS:

During the Wisconsin ice age, the area was covered by the glacial ice. This resulted in the deposition of glacial and glacio-fluvial materials. Part of the area was submerged by the glacial Lake Iroquois. During this period the lacustrine material was deposited over the existing glacial till.

Following are the main types of engineering soils described in the area. (Map 2).

1. GLACIAL TILL:

This is a heterogeneous, non-sorted glacial deposit immediately overlying the shale bedrock. This till because of its nature has given rise to clayey silts.

Engineering Properties: Soils containing appreciable quantities of fines (clay & silt) are the most troublesome in any engineering project. These materials show marked changes in physical properties with change of water content. When the moisture content does not change, the properties of fine soils may vary considerably between their natural condition in the ground and their state after being disturbed. When these soils are excavated for use as a construction material or when the natural deposit is disturbed by driving piles, the properties of the soil can change radically.

Poor to fair internal drainage is expected in these soils.

2. GLACIO-FLUVIAL DEPOSITS:

Two deposits of glacio-fluvial origin are located in the vicinity of Burnhamthorpe and Dixie Station. These deposits generally consist of well-graded and well-compacted sands and gravel.

Engineering Properties: The glacio-fluvial materials, when devoid of fines, are pervious and easy to compact. The moisture content does not affect these materials in any significant way, hence it is not subject to frost action. These deposits are generally a good

source of granular materials. Fair to good internal drainage is expected in these soils.

3. LACUSTRINE DEPOSITS:

These deposits were laid down in Lake Iroquois during the post-glacial period. These soils generally consist of lacustrine clays with varying proportions of silts.

Engineering Properties: Plasticity of these soils can vary from low to high but usually quite uniform in extent. Compaction is difficult especially when moisture is above optimum. Shear strength can vary with depth. Poor internal drainage is anticipated because of the fine-grained nature of the soil.

4. ALLUVIAL DEPOSITS

These deposits were formed by the reworking of various deposits in the area by the present streams. Stream valleys are eroded and where the stream loses its velocity the alluvial material is deposited.

Engineering Properties: The alluvial material can vary drastically from fine sands and silts to coarse sands and gravel. Organic material can be found as small pockets. Internal drainage can vary from poor to good.

5. ORGANIC DEPOSIT:

There is one organic deposit located in the vicinity of the

Interchange of Base Line Road and First Line (Maps 2 & 3). This deposit consists of soils rich in organic content. Because of its location in the vicinity of proposed Highway 403 and Base Line Road, this deposit deserves special mention. It is suggested that the actual nature and depth of this deposit should be ascertained in the field. Generally such deposits because of their low shear strength and high compressibility necessitate extreme measures while dealing with them. Engineering values of these materials are generally limited and precautionary measures are almost always necessary. Internal drainage in organic deposits is generally very poor. From airphotos this deposit seems to be shallow and consists of organic loam.

Drainage and Hydrology: The study area is drained by Etobicoke Creek and its tributaries. This creek and its tributaries can present a flood problem during the Spring. The internal drainage of the main soils in this area is poor to fair with the exception of a fluvio-glacial deposit which has good internal drainage.

The surface drainage is good and this can cause erosion problems along the stream valleys and steep slopes.

In glacial deposits which are generally well graded, the particles of moderate size fill the pore spaces between the larger particles, and in turn the resultant pore spaces are filled by the fine materials, thus forming a compactly knit and impervious mass.

The permeability of fluvio-glacial deposits varies with the

diameter and degree of assortment of the individual particles. A well-sorted gravel deposit has a much higher permeability than a well-sorted coarse sand. However, gravel with a moderate percentage of medium-grained and fine-grained material may be considerably less permeable than a uniformly sized coarse sand.

CONCLUSIONS:

In general the present corridor for the location of Highways 403 and 401 Interchange seems quite suitable. No major problems during construction or maintenance are anticipated. The following is a breakdown of various parameters which might be of interest:

1. STABILITY: The general area is considered free of instability problems. The organic deposit in the vicinity of proposed Highway 403 and Base Line Road seems to be of shallow nature and can be excavated and backfilled with suitable material according to the current M. T. C. Standards. Field work to ascertain its depth and other physical properties is suggested.
2. SUBGRADES: No subgrade problems are anticipated. The pertinent portion of organic soils in the vicinity of the above mentioned location if treated properly, along with a suitable provision for drainage, should not create any serious problems.

Frost heaving could be a problem in areas rich in fine-grained

soils especially where the water table is high. Carrying capacities of foundations are considered acceptable along the general corridor.

3. AVAILABILITY OF GRANULAR MATERIALS: Considering the nature of the granular formations outlined on the map, there should be an adequate supply of granular material within a reasonable haul distance of the proposed location. The major formations (fluvio-glacial) are outlined on the accompanying map #2 and should be tested for their evaluation.

4. VOLUME OF EARTHWORK: The volume of earthwork is considered to be moderate because of the general nature of the terrain. There will be some earthwork involved around the stream crossings and low lying areas rich in organic soils. Most of the materials requiring excavation should fall in the category of unconsolidated materials.

5. HYDROLOGICAL PROBLEMS: The area is drained by Etobicoke Creek and its tributaries which can present a flood problem during the Spring. This is because of the poor internal drainage of the soils involved and lack of ground cover. However, no major hydrological problems are expected in the area if adequate stream crossings are provided. There may be some areas with a high water table and this may pose minor problems during construction.

6. ACCESSIBILITY: The area is accessible by several existing roads. The amount and type of clearing and grubbing along the corridor is minimal. The existing roads should facilitate the haulage of materials during the construction.

The airphoto interpretation study reveals that the route should achieve a uniform alignment, gentle gradients and normal crossing of the drainageways and existing roads.

Considering the nature of the engineering soils and the hydrology of the area, the instability problems are considered negligible.

Aerial photography flown by the Ministry of Natural Resources in the year 1971 was used for interpretation purposes. There was no field work done during these investigations.

B. Sen Mathur,
Airphoto Interpretation Engineer.

APPENDIX III

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

MEMORANDUM

TO: Mr. M. Devata,
Sup. Foundation Engineer.

FROM: K. W. Ingham

ATTENTION:

DATE: July 14, 1972

OUR FILE REF.

IN REPLY TO

SUBJECT:

Foundation Investigation 72-11053;
Hwys. 403, 401 and 10 Interchange Complex

Twenty-six rock cores were recovered in this project, 25 of which are typical of the Dundas formation and one, the core from hole No. 12, is typical of the Queenston formation. The lithology of core No. 12 is characteristic of the lower beds of the Queenston close to its contact with the underlying Dundas. Hole 12 is apparently located in a lobe of the Queenston and thus does not affect the project area which is underlain by the Dundas.

The Dundas formation is a series of shales and limestones with minor sandstone and siltstone. On some horizons the formation is platy-bedded shale, on others the limestone slightly exceeds the shale in thin beds with interbedded shale. The limestone layers rarely exceed 0.5 ft. in thickness. Weathering of the upper layers varies from near zero to approximately 5.0 ft. Weathering is generally moderate, there are rare clay layers up to 0.3 ft. in thickness which are not felt to be significant to the overall bearing capacity of the rock. Where shale is at the rock surface there is a 0.5 to 1.0 ft. transition between the shale and overlying till, where limestone is at the surface there is no transition.

A brief description of each borehole is given below together with the appropriate bedrock elevation.

Hole No. 1

Bedrock Elevation 519.8

9.5 - 14.5

Interbedded limestone and dark grey shale.

14.5 - 19.5

Dark grey shale, platy bedded with some fissile sections, occasional thin beds of limestone and siltstone.

Hole No. 2

Bedrock Elevation 517.9

7.5 - 12.0 Interbedded limestone and dark grey shale.

12.0 - 15.5 Dark grey shale, platy bedded, occasional thin beds of limestone.

Hole No. 2B

Bedrock Elevation 480.9

9.0 - 9.4 Dark grey shale, fissile to platy bedded, moderately.

9.4 - 10.1 Limestone, single bed, slightly weathered.

10.1 - 13.5 Dark grey shale, platy bedded, minor thin bands of limestone and sandstone, moderately weathered in the upper 1.5 ft.

Hole No. 2C

Bedrock Elevation 442.9

38.0 - 40.0 No sample, assumed shale bedrock.

40.0 - 45.0 Dark grey shale, platy bedded to fissile, minor thin limestone bands.

Hole No. 3

Bedrock Elevation 428.9

61.0 - 67.0 No sample, assumed shale bedrock.

67.0 - 71.5 Dark grey shale, platy bedded.

Hole No. 4

Bedrock Elevation 423.4

68.0 - 75.0 Dark grey shale, platy bedded to fissile, minor thin beds of limestone.

Hole No. 5

Bedrock Elevation 438.2

51.0 - 57.0 Dark grey shale, platy bedded, occasional thin beds of limestone.

Hole No. 10

Bedrock Elevation 571.1

7.0 - 19.5 Interbedded dark grey shale, limestone, and medium bedded sandstone.

Hole No. 12

Bedrock Elevation 619.5

11.0 - 19.0 Red shale, thin to platy bedded, occasional thin beds of green sandstone and sandy limestone.

Hole No. 13

Bedrock Elevation 590.3

12.2 - 22.5

Interbedded limestone in medium to thin beds, and dark grey platy bedded shale.

Hole No. 14

Bedrock Elevation 597.9

8.5 - 18.5

Interbedded limestone in medium to thin beds, and dark grey platy bedded shale.

Hole No. 15

Bedrock Elevation 595.4

7.5 - 12.5

Interbedded limestone in medium to thin beds, and dark grey platy bedded shale, moderately to badly weathered throughout.

12.5 - 19.5

Interbedded dark grey shale and medium bedded limestone.

Hole No. 16

Bedrock Elevation 591.3

13.0 - 15.9

Interbedded limestone in thin beds and dark grey shale, moderately weathered throughout.

15.9 - 21.5

Dark grey shale, platy bedded, minor thin limestone bands.

Hole No. 17

Bedrock Elevation 583.5

9.0 - 18.0

Interbedded dark grey platy bedded shale and thin to medium beds of limestone.

Hole No. 18

Bedrock Elevation 564.7

4.2 - 8.0

Dark grey shale with thin limestone bands, badly weathered and fractured.

8.0 - 10.5

Dark grey shale with minor thin limestone bands, moderately weathered and fractured.

10.5 - 16.2

Interbedded dark grey shale and thin to medium bedded limestone.

16.2 - 19.1

Dark grey shale, platy bedded.

Hole No. 19

Bedrock Elevation 559.2

7.5 - 11.0

Interbedded limestone in medium beds and dark grey shale, moderately weathered and fractured throughout.

11.0 - 17.5

Dark grey shale with occasional thin limestone bands.

Hole No. 20

Bedrock Elevation 560.5

10.0 - 14.0

Interbedded limestone in thin to medium beds and dark grey shale, moderately weathered and fractured throughout.

14.0 - 21.0

Dark grey shale, minor thin beds of limestone.

Hole No. 21

Bedrock Elevation 495.3

31.0 - 37.5

Dark grey shale with minor thin limestone bands.

Hole No. 22

Bedrock Elevation 470.0

39.0 - 46.5

Dark grey shale, occasional thin to medium beds of limestone and sandstone.

Hole No. 23

Bedrock Elevation 456.6

50.0 - 54.0

Dark grey shale with minor thin limestone bands, badly fractured.

54.0 - 61.5

Dark grey shale with occasional thin beds of limestone and sandstone.

Hole No. 24

Bedrock Elevation 492.0

26.0 - 36.0

No sample. Assumed dark grey shale bedrock.

36.0 - 40.0

Dark grey shale, platy bedded, occasional thin limestone bands.

Hole No. 26

Bedrock Elevation 520.8

1.5 - 10.5

Limestone, thin to medium bedded, occasional bands of dark grey shale and thin beds of sandstone.

10.5 - 13.5

Dark grey shale, minor thin bands of limestone.

Hole No. 27

Bedrock Elevation 517.7

2.8 - 5.6 Limestone, thin bedded, occasional bands of dark grey shale and siltstone.

5.8 - 7.6 Dark grey shale, platy bedded.

Hole No. 28

Bedrock Elevation 518.9

3.0 - 5.0 Limestone, thin bedded, occasional thin bands of dark grey shale and siltstone. Badly weathered 3.0 to 3.8, moderately weathered 3.8 to 4.8.

5.0 - 5.7 Dark grey shale, platy bedded, slightly weathered throughout.

5.7 - 6.5 Limestone, medium bedded.

6.5 - 8.5 Dark grey shale, platy bedded.

Hole No. 29

Bedrock Elevation 502.2

3.8 - 13.8 Dark grey shale, platy bedded, frequent thin limestone bands.

Hole No. 30

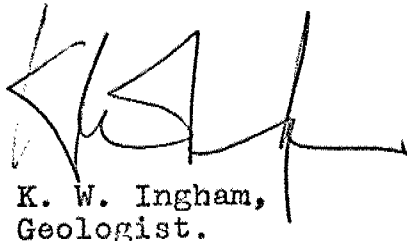
Bedrock Elevation 495.0

2.0 - 3.2 Interbedded limestone in thin to medium beds and dark grey platy bedded shale.

3.2 - 12.0 Interbedded dark grey shale and thin to medium beds of limestone.

An estimated bulking factor for rock fill would be in the range 10-15%, however, since the type of rock is very similar to that encountered in the Q.E.W. - 427 construction, it would be advisable to use the appropriate values from this work if they are available.

KWI:mv


K. W. Ingham,
Geologist.

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO T.P.-1

JOB 72-11053

LOCATION Co-ords. 16,848,933 N; 1,964,796 E.

ORIGINATED BY BTD

W.P. 127-66-01

BORING DATE Sept. 19, 1972

COMPILED BY JG

DATUM Geodetic

BOREHOLE TYPE Test Pit 6' x 10' at bottom

CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT _____W _L PLASTIC LIMIT _____W _p WATER CONTENT _____W <div><div>W_p</div><div>W</div><div>W_L</div></div> WATER CONTENT %				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
497.0	Ground Level															
0.0	(Glacial Till)															
	Dessicated					490										
	----- Brown Grey															
	Clayey silt with some sand and gravel															
	Random boulders up to 7"					480										▼ 482.0
478.0																
19.0	End of Test Pit															
						470										

RECORD OF BOREHOLE N^o T.P.-2

JOB 72-11053

LOCATION Co-ord. 16,849,785 N; 1,963,840 E.

ORIGINATED BY BTD

W.P. 127-66-01

BORING DATE Sept. 19, 1972

COMPILED BY JG

DATUM Geodetic

BOREHOLE TYPE Test Pit 6' x 8' at bottom

CHECKED BY SK.

SOIL PROFILE			SAMPLES			ELEV. SCALE ELEV.	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT _____	Liquid Limit ____WL____ Plastic Limit ____WP____ WATER CONTENT ____w____	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	$w_p \quad w \quad w_L$ WATER CONTENT %	
499.0	Ground Level								P.C.F. GR.SA.SI.CL.
0.0	(Glacial Til)								
	Dessicated Brown Grey Clayey silt with some sand and gravel Random boulders up to 8"					490			
482.5									
16.5	End of Test Pit					480			

Mr. M. Devata,
Sup. Foundation Engineer.

K. W. Ingham

July 14, 1972

Foundation Investigation 72-11053;
Hwys. 403, 401 and 10 Interchange Complex

Twenty-six rock cores were recovered in this project, 25 of which are typical of the Dundas formation and one, the core from hole No. 12, is typical of the Queenston formation. The lithology of core No. 12 is characteristic of the lower beds of the Queenston close to its contact with the underlying Dundas. Hole 12 is apparently located in a lobe of the Queenston and thus does not affect the project area which is underlain by the Dundas.

The Dundas formation is a series of shales and limestones with minor sandstone and siltstone. On some horizons the formation is platy-bedded shale, on others the limestone slightly exceeds the shale in thin beds with interbedded shale. The limestone layers rarely exceed 0.5 ft. in thickness. Weathering of the upper layers varies from near zero to approximately 5.0 ft. Weathering is generally moderate, there are rare clay layers up to 0.3 ft. in thickness which are not felt to be significant to the overall bearing capacity of the rock. Where shale is at the rock surface there is a 0.5 to 1.0 ft. transition between the shale and overlying till, where limestone is at the surface there is no transition.

A brief description of each borehole is given below together with the appropriate bedrock elevation.

Hole No. 1

Bedrock Elevation 519.8

9.5 - 14.5

Interbedded limestone and dark grey shale.

14.5 - 19.5

Dark grey shale, platy bedded with some fissile sections, occasional thin beds of limestone and siltstone.

<u>Hole No. 2</u>	Bedrock Elevation 517.9
7.5 - 12.0	Interbedded limestone and dark grey shale.
12.0 - 15.5	Dark grey shale, platy bedded, occasional thin beds of limestone.
<u>Hole No. 2B</u>	Bedrock Elevation 480.9
9.0 - 9.4	Dark grey shale, fissile to platy bedded, moderately.
9.4 - 10.1	Limestone, single bed, slightly weathered.
10.1 - 13.5	Dark grey shale, platy bedded, minor thin bands of limestone and sandstone, moderately weathered in the upper 1.5 ft.
<u>Hole No. 2C</u>	Bedrock Elevation 442.9
38.0 - 40.0	No sample, assumed shale bedrock.
40.0 - 45.0	Dark grey shale, platy bedded to fissile, minor thin limestone bands.
<u>Hole No. 3</u>	Bedrock Elevation 428.9
61.0 - 67.0	No sample, assumed shale bedrock.
67.0 - 71.5	Dark grey shale, platy bedded.
<u>Hole No. 4</u>	Bedrock Elevation 423.4
68.0 - 75.0	Dark grey shale, platy bedded to fissile, minor thin beds of limestone.
<u>Hole No. 5</u>	Bedrock Elevation 438.2
51.0 - 57.0	Dark grey shale, platy bedded, occasional thin beds of limestone.
<u>Hole No. 10</u>	Bedrock Elevation 571.1
7.0 - 19.5	Interbedded dark grey shale, limestone, and medium bedded sandstone.
<u>Hole No. 12</u>	Bedrock Elevation 619.5
11.0 - 19.0	Red shale, thin to platy bedded, occasional thin beds of green sandstone and sandy limestone.

Hole No. 13 Bedrock Elevation 590.3

12.2 - 22.5 Interbedded limestone in medium to thin beds, and dark grey platy bedded shale.

Hole No. 14 Bedrock Elevation 597.9

8.5 - 18.5 Interbedded limestone in medium to thin beds, and dark grey platy bedded shale.

Hole No. 15 Bedrock Elevation 595.4

7.5 - 12.5 Interbedded limestone in medium to thin beds, and dark grey platy bedded shale, moderately to badly weathered throughout.

12.5 - 19.5 Interbedded dark grey shale and medium bedded limestone.

Hole No. 16 Bedrock Elevation 591.3

13.0 - 15.9 Interbedded limestone in thin beds and dark grey shale, moderately weathered throughout.

15.9 - 21.5 Dark grey shale, platy bedded, minor thin limestone bands.

Hole No. 17 Bedrock Elevation 583.5

9.0 - 18.0 Interbedded dark grey platy bedded shale and thin to medium beds of limestone.

Hole No. 18 Bedrock Elevation 564.7

4.2 - 8.0 Dark grey shale with thin limestone bands, badly weathered and fractured.

8.0 - 10.5 Dark grey shale with minor thin limestone bands, moderately weathered and fractured.

10.5 - 16.2 Interbedded dark grey shale and thin to medium bedded limestone.

16.2 - 19.1 Dark grey shale, platy bedded.

<u>Hole No. 19</u>	Bedrock Elevation 559.2
7.5 - 11.0	Interbedded limestone in medium beds and dark grey shale, moderately weathered and fractured throughout.
11.0 - 17.5	Dark grey shale with occasional thin limestone bands.
<u>Hole No. 20</u>	Bedrock Elevation 560.5
10.0 - 14.0	Interbedded limestone in thin to medium beds and dark grey shale, moderately weathered and fractured throughout.
14.0 - 21.0	Dark grey shale, minor thin beds of limestone.
<u>Hole No. 21</u>	Bedrock Elevation 495.3
31.0 - 37.5	Dark grey shale with minor thin limestone bands.
<u>Hole No. 22</u>	Bedrock Elevation 470.0
39.0 - 46.5	Dark grey shale, occasional thin to medium beds of limestone and sandstone.
<u>Hole No. 23</u>	Bedrock Elevation 456.6
50.0 - 54.0	Dark grey shale with minor thin limestone beds, badly fractured.
54.0 - 61.5	Dark grey shale with occasional thin beds of limestone and sandstone.
<u>Hole No. 24</u>	Bedrock Elevation 492.0
26.0 - 36.0	No sample. Assumed dark grey shale bedrock.
36.0 - 40.0	Dark grey shale, platy bedded, occasional thin limestone bands.
<u>Hole No. 26</u>	Bedrock Elevation 520.8
1.5 - 10.5	Limestone, thin to medium bedded, occasional bands of dark grey shale and thin beds of sandstone.
10.5 - 13.5	Dark grey shale, minor thin bands of limestone.

Hole No. 27

Bedrock Elevation 517.7

2.8 - 5.6

Limestone, thin bedded, occasional bands of dark grey shale and siltstone.

5.8 - 7.6

Dark grey shale, platy bedded.

Hole No. 28

Bedrock Elevation 518.9

3.0 - 5.0

Limestone, thin bedded, occasional thin bands of dark grey shale and siltstone. Badly weathered 3.0 to 3.8, moderately weathered 3.8 to 4.8.

5.0 - 5.7

Dark grey shale, platy bedded, slightly weathered throughout.

5.7 - 6.5

Limestone, medium bedded.

6.5 - 8.5

Dark grey shale, platy bedded.

Hole No. 29

Bedrock Elevation 502.2

3.8 - 13.8

Dark grey shale, platy bedded, frequent thin limestone bands.

Hole No. 30

Bedrock Elevation 495.0

2.0 - 3.2

Interbedded limestone in thin to medium beds and dark grey platy bedded shale.

3.2 - 12.0

Interbedded dark grey shale and thin to medium beds of limestone.

An estimated bulking factor for rock fill would be in the range 10-15%, however, since the type of rock is very similar to that encountered in the Q.E.W. - 427 construction, it would be advisable to use the appropriate values from this work if they are available.

KWI:mv


K. W. Ingham,
Geologist.

Planning
Engineering
Project Management

FENCO

1 Yonge Street
Toronto Canada
416-361-4722
Cable 'Foundaneng'
Telex 02 2814

September 1, 1972

Mr. M.S. Devata
Supervising Foundations Engineer
Ministry of Transportation and
Communications
West Building
Downsview 464, Ontario

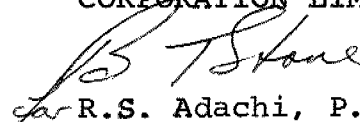
Dear Sir,

HIGHWAY 401-HIGHWAY 403 INTERCHANGE
WEST LIMITS OF HIGHWAYS 401/27
INTERCHANGE TO HIGHWAY 10
W.P. 127-66-01

Further to our discussion, we enclose plans and profiles of the proposed storm sewer in the vicinity of Eglinton Avenue, Cawthra Road, and Highway 403 Interchange outletting easterly to Little Etobicoke Creek.

The approximate size of the sewer system will be a maximum of 84" with invert elevations approximately 15 feet down from the original ground line. Prior to finalizing our drainage study we would appreciate your comments with regard to feasibility of construction in view of the severe artesian condition which exists.

Yours very truly,
FOUNDATION OF CANADA ENGINEERING
CORPORATION LIMITED


R.S. Adachi, P.Eng.
HIGHWAY ENGINEER

BTS/bhw
3983-101-1
Enc.

cc: Mr. W.C. Friedmann - MTC Downsview



Mr. W. C. Friedmann,
Reg. Expressway Design Engineer,
Central Region,
3501 Dufferin St., Downsview.

Foundations Office,
Design Services Branch,
West Bldg., Downsview.

August 20, 1973.

Mr. N. Sen.

*Matheson Blvd. Extension (From 1st Line E to
2nd Line E) and Hwy.'s #410 & #403
Town of Mississauga, District #8 (Toronto)
W.O. 72-11053 -- W.P. 127-66-37*

The Foundations Office was requested to provide preliminary comments with regard to the feasibility for the proposed alignment of Matheson Blvd. Extension. The request was contained in a memo from Mr. W. C. Friedmann, Regional System Design Office, dated August 1, 1973.

One borehole was put down at the crossing of Hwy. #403 S.B.L. and the proposed Matheson Blvd. Extension, in order to determine the subsoil, bedrock and groundwater conditions existing at the site. The boring location is shown on the accompanying sketch. The detail subsoil conditions at the boring location are presented on the Record of Borehole sheet, also appended to this letter. The boring revealed that the subsoil consists of 7 ft. of heterogeneous mixture of clayey silt, sand and gravel (glacial till), underlain by shale bedrock. The glacial till is competent. It is, therefore, concluded that the proposed alignment for the Matheson Blvd. Extension is feasible from the foundation point of view. Spread footing type of foundations located within the competent glacial till or the shale bedrock may be used to support the structure(s). This Office will carry out a detailed subsurface investigation for this project and provide specific recommendations once the scheme is finalized.

This memo, together with the attached sketch and Record of Borehole sheet should be included in our Preliminary Foundation Investigation Report W.O. 72-11053.

We believe the foregoing will be adequate for your present requirements. Should you require additional information, please feel free to contact this Office.

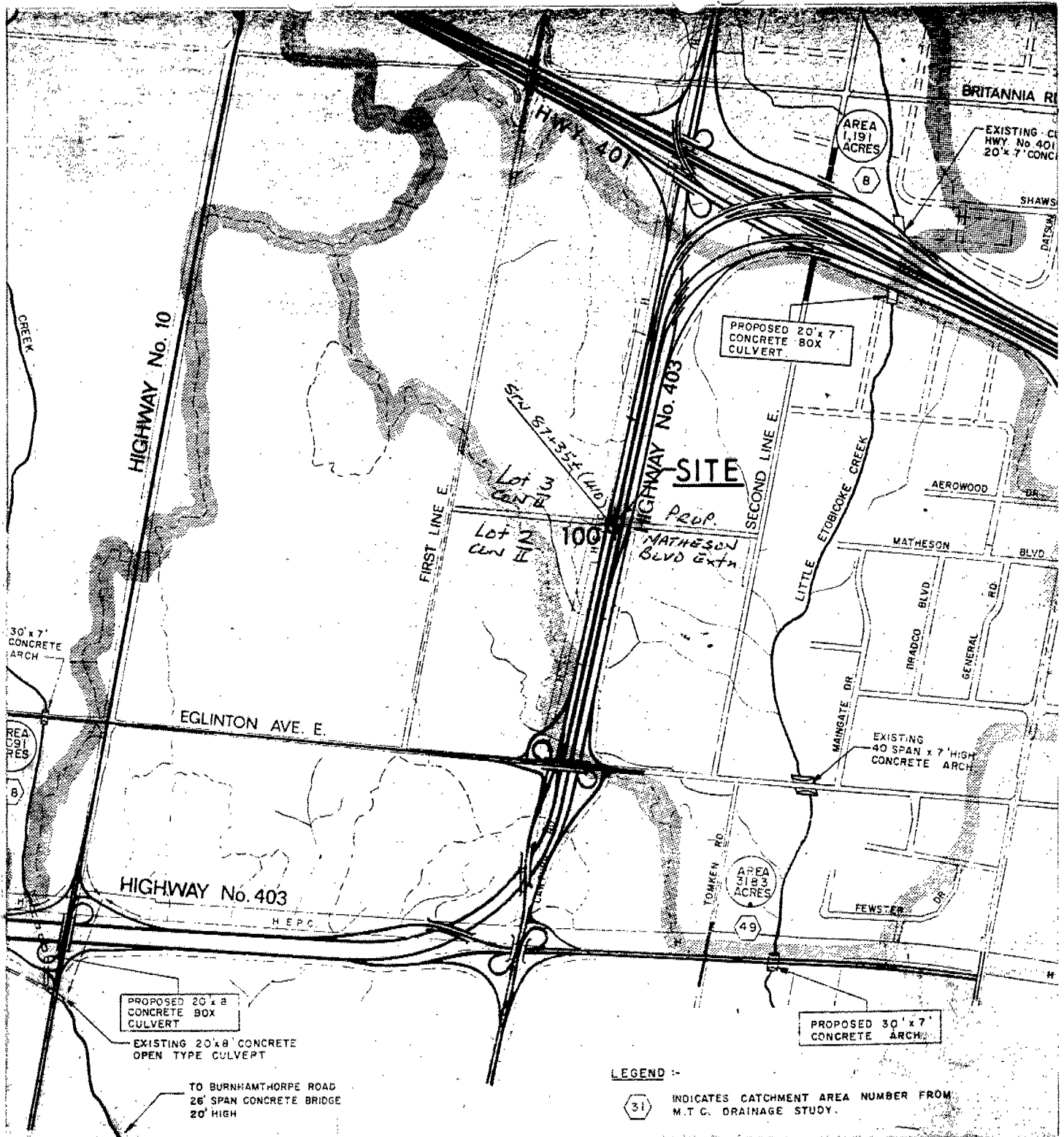
C. S. Poon

For: C. S. Poon,
Project Foundations Engineer,
M. Devata,
Supervising Foundations Engineer.

CSP/ao
Attch.

c.c. G.C.E. Burkhardt
C. Mirza
R. Oddson
Fenco (Attn: Mr. R. Adachi)

Foundations Files
Documents



PLAN

2000 1000 0 SCALE 2000 4000 FT.

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 100

JOB 72-11053

LOCATION Sta. 88 + 35 Ø (Hwy. 403 S.B.L.)

ORIGINATED BY JB

W.P. 127-66-37

BORING DATE Aug. 14 - 15, 1973

COMPILED BY CSP

DATUM Geodetic

BOREHOLE TYPE Washboring, BXL Rock Core & Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — W _L		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT — W _P	WATER CONTENT — W		
514.7	Ground Level											
0.0	Het. mix. of clayey silt to traces of sand & gravel (Glacial Till)		1	SS	21							
507.7	Grey. V. Stiff to Hard		2	SS	81							
7.0	Bedrock Shale with layers of limestone. Grey		3	SS	100							
500.4	Moderately weathered		4	BXL	75%							
14.3	End of Borehole		5	BXL	70%							
			6	BXL	74%							

510

100/6"

500

510.2

TEST PIT Nº 1
CAWTHRA RD.
SEPT. 19, 1972



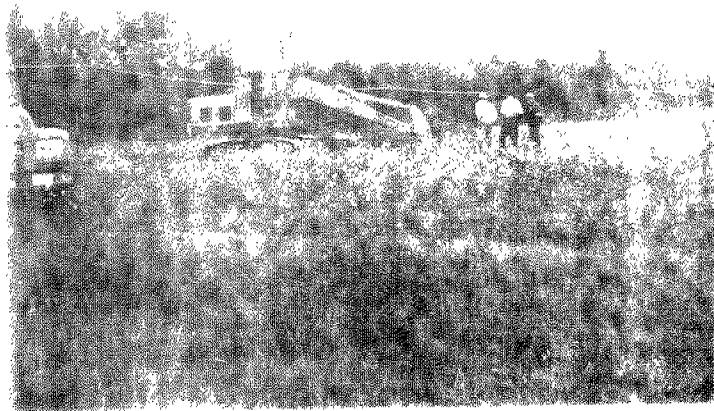
TEST PIT - showing caving of walls of pit at
14 ft. depth (granular layers) - seepage of
ground water into pit.

TEST PIT Nº 2
BASELINE RD. & CAWTHRA RD.
SEPT. 19, 1972



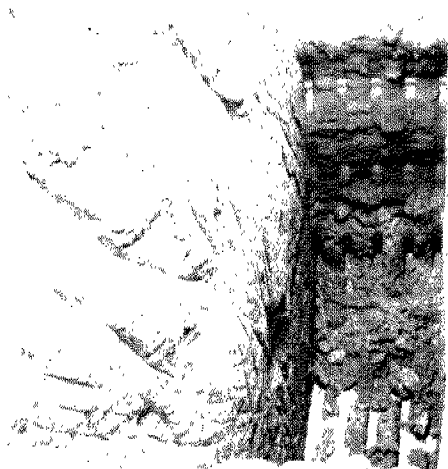
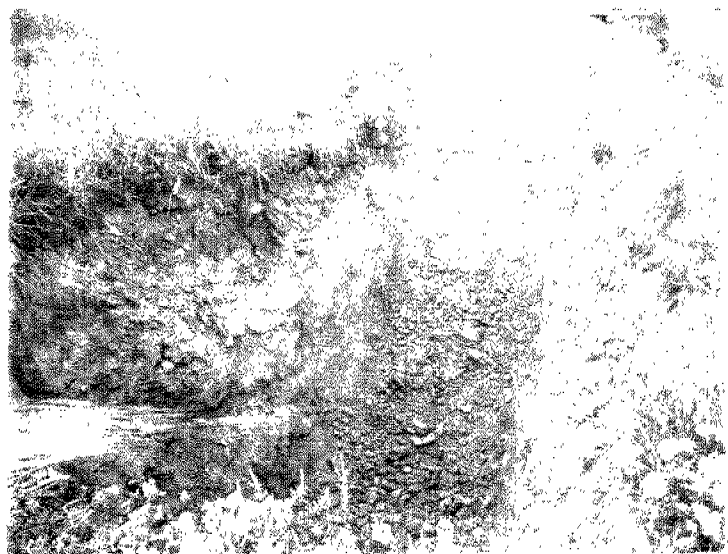
TEST PIT - 16.5 ft. deep showing dry nature
of excavation - only slight seepage into base.

TEST PIT NO 1
CAWTHRA RD.
SEPT. 19, 1972



-General area.

Test pit - at depth of 8 ft. - hole dry.



-Test pit - showing ground water
seepage into base of pit as well as
sloughing of excavated faces

DEPARTMENT
OF
TRANSPORTATION AND COMMUNICATIONS

Form
SB-OS-62

ACTION SLIP

DATE

OCT 19 / 73

TO

MR. M. DEVATA

FROM

D. BYE STRUCT. PLANNING
OFFICE

☐

NOTE AND
FILE

☐

PREPARE REPLY FOR
MY SIGNATURE

☐

NOTE AND
RETURN TO ME

☐

TAKE APPROPRIATE
ACTION

☐

RETURN WITH MORE
DETAILS

☐

PER YOUR
REQUEST

☐

NOTE
AND SEE ME

☐

FOR YOUR
SIGNATURE

☐

PLEASE
ANSWER



FOR YOUR
INFORMATION

☐

FOR YOUR
APPROVAL

☐

INVESTIGATE AND
REPORT

☐

RETURN WITH YOUR
COMMENTS

☐

AS DISCUSSED

Re: BRIDGE 37 WP 127-66-12

COMMENTS BRIDGE 38 WP 127-66-25

PLEASE FIND ATTACHED, COPY OF
LETTER FROM REGIONAL MATERIALS
AND TESTING REGARDING COMMENTS
ON THE REVISED PROFILES OF
HWYS 403, 410 & EGLINTON
Ave. LRB.

72-F-53

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. R. W. Oddson, FROM: Materials and Testing Office,
Regional Expressway Design Engineer, Central Region.
Systems Design Office,
Central Region.
ATTENTION: Mr. W. Roters, DATE: October 18, 1973
Sr. Project Design Engineer.
OUR FILE REF. IN REPLY TO

SUBJECT: Re: W.P. 127-66-01 and -38; (Contracts #7 and #8)
Hwy. 403 - Hwy. 410, North of Eglinton Avenue
Southerly to Hwy. 10 Including Hwy. 403
Extension to Dixie Road, Toronto District

As requested at Progress Meeting No. 8 held on October 16, 1973, I have reviewed the revised grades for Hwy. 403, Hwy. 410, and Eglinton Avenue.

The new lower profile (maximum of 7 ft. \pm at Eglinton Avenue) was established from footing elevations for Bridges #37 and #38, set by the Foundations Section at the special meeting held on September 25, 1973.

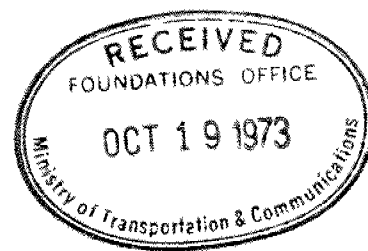
As a result, the fills have been reduced and a shallow cut (3' maximum on Hwy. 403 E.B.) is now required in the vicinity of Bridge #38.

From a Soils viewpoint, the new grades are acceptable, as they still lie either on or well up in the glacial till deposit. No stability problems were anticipated with the original roadway fills, and by lowering the grade it can only improve the situation.

Dennis Hogg
D. Hogg,
Project Soils Engineer.

DH:nr

c.c. C.C. Parker
(Attention: R. Lewis)
G.C.E. Burkhardt





Memorandum

To: Mr. C. Mirza, Head,
Soils Mechanics Section,
West Building.

From: K.R. Worsley,
Planning and Design Office,
Central Region.

Attention:

Date: May 31, 1976.

Our File Ref.

In Reply to

Subject: Soil Conditions at Foundation Locations,
Highway 403 - Highway 10 Westerly and
Southerly to Q.E.W., Including the
Winston Churchill Blvd./Q.E.W. Interchange,
W.P.'s 127-66-01, 156-75-01, 157-75-01 & 03,
158-75-01, 159-75-01 & 05.

Two consultant firms, DeLeuw Cather and Giffels have been retained to carry out pre-design work for Highway 403. As part of their study a Hops balancing and mass haul program will be generated. For the Hops program, in fact, the entire consultant study to be meaningful and worthwhile and meet scheduled dates, the consultants need accurate foundation information as soon as possible. Planning and Design Office therefore requests that you gear yourself to providing the consultants with foundation information by mid-July, 1976.

It is imperative that we obtain your co-operation since soils information will have repercussions on most phases of the consultants study.

For your information, a similar request has been sent to Regional Materials and Testing. You may wish to co-ordinate your studies with them in an effort to expedite this matter.

WHR:KRW:sm

K.R. Worsley,
Project Designer,
for:
W.H. Roters,
Area Manager.

cc: W.P. Greskow
N. Sen
I. Hausmanis (Giffels)





memorandum



Planning & Design Section, Central Region

To: F. I. Hewson,
Senior Structural Engineer,
Structural Section,
Central Region.

Date: 1979 10 23

RE: W.P. 127-66-01, Highway 403,
Cawthra Road to Highway 10,
Relocation of Bell Ducts.

Reference is made to your memo of 1979-10-17 to N. Johnston, copy to me regarding the proposed installation of the underground ducts adjacent to the Highway 10 bridge footing.

Please confirm if the above location has been okayed by our Pavement and Foundation Design Section, and if not, then I suggest that it should be.

A handwritten signature in dark ink, appearing to read "N. Sen".

N. Sen,
Sr. Project Manager.

NS/dmd

cc. F. E. Wilson
N. Johnston
✓ M. Devata



→ D. Ly
✓
Files





Ontario

Action
Memo

Time

Date

79, 11, 06

To

M. Devata.

MM → File

From

Ted Hewson

WP 127-66-01

<input type="checkbox"/> Phoned	<input type="checkbox"/> Please Call	<input type="checkbox"/> Will Call Back	Telephone No. 3097
<input type="checkbox"/> On Hold	<input type="checkbox"/> Returned Your Call	<input type="checkbox"/> Wishes Appointment	
<input type="checkbox"/> Waiting in Person	<input type="checkbox"/> Was Here	<input type="checkbox"/> Will Return	Message Taken By

<input type="checkbox"/> File	<input type="checkbox"/> Draft Reply For My Signature	<input type="checkbox"/> Provide More Details	<input type="checkbox"/> For Your Information
<input type="checkbox"/> Type Draft	<input type="checkbox"/> For Your Approval and Signature	<input type="checkbox"/> Keep Me Informed	<input type="checkbox"/> Per Discussion
<input type="checkbox"/> Type Final	<input type="checkbox"/> Circulate, Initial and Return	<input type="checkbox"/> Take Appropriate Action	<input type="checkbox"/> Per Your Request
<input type="checkbox"/> Copies	<input type="checkbox"/> Return With Comments	<input type="checkbox"/> Note and See Me	<input type="checkbox"/> Returned With Thanks
<input type="checkbox"/> Please Answer	<input checked="" type="checkbox"/> Investigate and Report	<input type="checkbox"/> Note and Return	<input type="checkbox"/>

Comments:

Conduit is 65' from E Hwy 10
with EL 513.5 at top. It is 0.415 m
to square so btm is about EL 512.

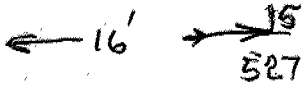
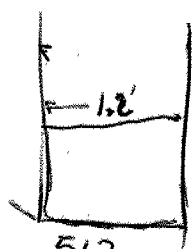
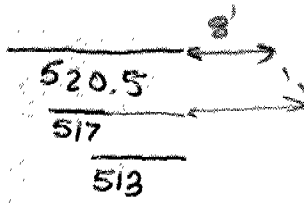
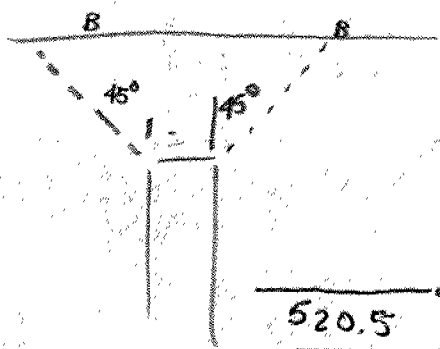
Ftg. depths & Elev. as shown.

Must Bell be careful? Please
phone as Bell are starting any day
now.

Ted

☐ Over

520 - 512



load 10 p.s.f.

memorandum



Planning & Design Section, Central Region

To: Mr. N. Johnston
District 6 Utilities
West Building.

Date: 1979 11 08

Re: W.P. 127-66-01 - Proposed Bell Canada
duct lowering along Hwy. 10 under Hwy 403

Our Consultant has reviewed the proposed duct lowering under Hwy. 403 and as indicated by his letter of 79 10 04 (copy attached) clearances etc. are acceptable. Planning and Design has determined these further requirements:

1. No blasting to be allowed during excavation.
2. Cut slopes for duct excavation cannot exceed 1:1 between the Hwy. 10 overpass abutments.
3. Backfill is to be well compacted granular 'A' up to 4 feet below earth subgrade with a 2-foot well compacted clay seal above that from ditchline to ditchline of Hwy. 403. Outside the ditchlines, native backfill may be used. Of course, above the clay seal, native backfill may be used (part of this will be re-excavated for Hwy. 403 construction).

I am advised by our Regional Structural Planning Office that this installation will not conflict with the structure when the above requirements #1 and #2 are met.

Please advise Bell Canada of these requirements. Returned herewith is one copy of Plan #401 as requested. I have advised D. Cherry of Bell Canada by phone of backfill requirements. However, please confirm by written memo.

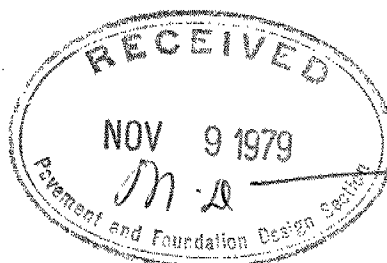
K.A. Cameron

K.A. Cameron
For:
N. Sen
Sr. Project Manager

KAC/GB

Encl.

c.c. P. Penev
T. Hewson
M. Devata



✓ → Files
M.M.
↓
Please note and cc me
↓