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W.P. No. 36-74-01

CONT. No. 77-21

W. O. No.

STR. SITE No.

HWY. No.

LOCATION Little Etobicoke Creek Culvert

No. of PAGES -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

CONT 77-21

Ministry of Transportation and Communications
Ontario

Memorandum

To: Mr. G.C.E. Burkhardt (3)
Regional Structural Planning Engineer
Central Region
3501 Dufferin Street, Downsview

Attention:

Our File Ref. W.P. 36-74-01

From: Soil Mechanics Section
Geotechnical Office
West Building, Downsview

Date: April 1, 1976

APR 06 1976

In Reply to

Subject:

30M12 - 114
GEOCRES No.

FOUNDATION INVESTIGATION REPORT
W.P. 36-74-01
District 6, Toronto
Matheson Blvd. Extension
The Little Etobicoke Creek Culvert

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 requirements. Should additional information be required, please do not hesitate to contact our Office.

M. Devata
M. DEVATA
Supervising Engineer

cc: R.S. Pillar
C.S. Grebski
B.J. Giroux
G.A. Wrong
M.R. Ernesaks
D. Gunter
H. Greenland
R. Hore
J. Anderson)
R. Fitzgibbon) memo only
G. Sloan)
Files

TABLE OF CONTENTS

FOUNDATION INVESTIGATION REPORT

for

W.P. 36-74-01
District 6, Toronto
Matheson Blvd. Extension
The Little Etobicoke Creek Culvert

1. INTRODUCTION

The Soil Mechanics Section was requested to carry out a subsurface investigation at the site of the proposed box culvert where Matheson Blvd. extension crosses Little Etobicoke Creek. The request was contained in a memorandum from Mr. G.C.E. Burkhardt, Regional Structural Planning Engineer, Central Region, dated December 5, 1975. Subsequently, an investigation was carried out by this Section.

This report contains the results of the investigation, together with our recommendations pertaining to the foundation design of the proposed culvert.

2. DESCRIPTION OF THE SITE AND GEOLOGY

The site is located at the crossing of the proposed westerly extension of Matheson Blvd. and Little Etobicoke Creek, about 1000 ft. east of Heart Lake Road in the city of Mississauga, Regional Municipality of Peel. The creek flows in a southerly direction. The land on the east side of the creek is occupied by light industry and on the west side it is open field.

The topography of the area is flat to undulating. Physiographically, this area is known at the "Peel Plain".

The characteristic deposit in the area under investigation is a cohesive glacial till of variable thickness. The overburden is underlain by shale bedrock.

3. FIELD AND LABORATORY WORK

During the course of investigation three sampled boreholes were carried out. The borings were carried out by means of a bombardier mounted hollow stem auger machine, adapted for soil sampling purposes.

Sampling in glacial till deposit was done by driving a 2" O.D. split-spoon sampler at required depths in accordance with the specifications for the Standard Penetration Test.

Groundwater level observations were made in the open boreholes during the period of investigation.

The soil and groundwater conditions encountered at the boring locations are presented in the Record of Borehole Sheets. The location and ground elevation of the various boreholes were surveyed in the field by Engineering Surveys of the Central Region, Toronto.

The borehole locations and elevations, together with estimated stratigraphy, is shown on Drawing No. 367401-A.

All samples were subjected to a careful examination in the field and subsequently, in the laboratory. Following this examination, laboratory testing was carried out on selected representative samples to determine the various physical properties, namely:

Atterberg Limits
Natural Moisture Content
Grain-Size Distribution

The results of the laboratory testing are presented on the Record of Borehole Sheets and summarized on Figures 1-2 in the Appendix of this report.

4. SUBSOIL CONDITIONS

(4.1) General

The subsoil across the site consists of a deposit of glacial till, a heterogeneous mixture of clayey silt, sand and gravel. The cohesive glacial till is underlain by shale bedrock.

(4.2) Heterogeneous Mixture of Clayey Silt, Sand and Gravel-Glacial Till

This is the predominant stratum and varies from 6 to 10 ft. in thickness across the site. The material is mainly a heterogeneous mixture of clayey silt, sand and gravel of glacial origin. The soil samples were tested for Atterberg Limits and natural moisture content. The results, which are shown on the Record of Borehole Sheets and on the Plasticity Chart,(Fig. 1) are tabulated below:

	Range
Liquid Limit %	27-33
Plastic Limit %	19-21
Natural Moisture Content %	11-15

Based on the above values, it is estimated that the matrix of the glacial till is inorganic and of low plasticity.

The grain-size distribution curves for samples of this cohesive deposit are shown on Fig. 2 in the Appendix.

The results of Standard Penetration Tests gave 'N' values ranging from 43 to 80 blows per foot except in Borehole #3, where the upper portion gave 'N' values of 9 to 15 blows/ft. It is estimated that the cohesive glacial till deposit generally has a hard consistency, except in certain locations where it is stiff to very stiff.

(4.3) Shale Bedrock

Underlying the glacial till deposit is the shale bedrock which was proven in all the three boreholes by obtaining BXL core samples.

The bedrock is composed of a dark grey interbedded shale with minor limestone bands. The upper 2 to 4 ft. of the bedrock is in a weathered condition. The bedrock surface varies from elevation 475.5 on the north to elevation 471.7 ft. on the south side, which corresponds to 6 ft. to 10 ft. below the ground surface. The creek was dry at the time of investigation.

5. GROUNDWATER CONDITIONS

The groundwater levels were established in the open boreholes during the period of field investigation (Dec/75). The results of the readings are shown on the borelog sheets, as well as on Drawing No. 367401A.

The observations indicate that the groundwater level varies from elevation 476.6 to 479.2, which corresponds to 2.5 to 4.5 ft. below the ground surface.

6. DISCUSSION AND RECOMMENDATIONS

(6.1) General

It is proposed to extend the existing Matheson Blvd. westward and connect with the future new Hwy. 403 intersection. As part of this additional section of road, a culvert will be required to carry Matheson Blvd. over Little Etobicoke Creek. The Creek is located about 50 ft. west of the terminus of the existing Matheson Blvd. At present a 20' x 7' and 170 ft. long box culvert is being considered for this crossing. Due to other requirements the size of the opening may be changed.

The lowest elevation of the existing creek channel at the crossing is about 478 ft. The profile grade of the proposed Matheson Blvd. is 490 ft. Based on this it is estimated that fills with a maximum height of 12 ft. will be placed in the vicinity of the proposed culvert. The predominant stratum across the site is a cohesive glacial till. Its thickness varies from 6 ft. to 10 ft. The glacial till is underlain by shale bedrock.

(6.2) Embankment Fill

No stability problems are anticipated for a 12 ft. high embankment constructed with 2:1 side slopes. All surficial organic material should be removed within the plan limits of the base of the embankment.

(6.3) Rigid Frame Concrete Box Culvert

The invert elevation of the proposed culvert is not finalized. The box culvert may be founded within the glacial till stratum using an allowable load of 2 tons/sq. ft. for design purposes. The culvert should not be placed within the weathered portion of shale bedrock. If the invert elevation is such that the culvert is founded on shale bedrock, then a design load of up to 5 tons/sq. ft. may be used for the weathered shale and a design load of up to 10 tons/sq. ft. may be used for the sound shale bedrock. The glacial till, as well as shale bedrock, are susceptible to softening when exposed. Therefore, a 6 in. thick granular pad or a lean concrete working slab should be placed immediately after the excavation is completed.

A minimum of 4 ft. of earth cover should be provided to the underside of the bottom of the culvert for frost protection purposes. The foundation excavations for the culvert will extend some 4-5 ft. below the groundwater level established during the course of field investigation. The cohesive glacial till is relatively impervious. Also, during the time of investigation, the creek channel was dry (Dec. 1975). No major dewatering problems are anticipated if construction is carried out during dry season. Any minor seepage into the excavations could be controlled by employing conventional techniques, such as pumping from sumps.

The culvert will be designed as a rigid frame. Therefore, a coefficient of earth pressure at rest (K_0) of 0.5 should be assumed for the granular backfill behind the wall when designing the wall sections. In addition, the design should incorporate the full effect of the surcharge located above the walls. In computing the horizontal sliding resistance between the base of the foundation and the cohesive glacial till subsoil, an adhesion value of 2000 p.s.f. may be used. However, if the culvert is founded in shale, a coefficient of frictional resistance of 0.6 can be used. Backfill for the culvert excavations should comply with currently used Ministry Standards.

7. MISCELLANEOUS

The field work, performed during the period of December 15-16, 1975, was supervised by Mr. V. Korlu, Project Engineer, who also prepared this report.

Equipment was owned and operated by F.E. Johnston Drilling Co. Ltd. of Toronto.

This report was reviewed by Mr. M. Devata, Supervising Engineer.

for V. KORLU
Project Engineer

M. DEVATA
Supervising Engineer

April, 1976

APPENDIX

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

ENGINEERING SERVICES BRANCH - GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE № 1

WP 36-74-01 LOCATION Co-ords. 15,855,060 N; 963,291 E. ORIGINATED BY VK

DIST 6 HWY Local BORING DATE December 15, 1975 COMPILED BY VK

DATUM Geodetic BOREHOLE TYPE CME (5.1) M.V.H.S. CHECKED BY [signature]

SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100); SHEAR STRENGTH: o UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE	LIQUID LIMIT — W_L; PLASTIC LIMIT — W_P; WATER CONTENT — W; WATER CONTENT % (10 20 30)	UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES	ELEV				
481.5	Ground Level									
0.0	Het.mix.of clayey silt, sand & gravel (Glacial Till) Hard		1	SS	80	▼ 480		o ├──┤		28 12 39 21
475.5 / 6.0	weathered		2	SS	100/5"					
472.5 / 9.0	sound Shale Bedrock with minor limestone bands. Dark Grey		3	SS	100/1"					
			4	BXL	Rec 36%	470				
			5	BXL	Rec 50%					
462.5 / 19.0	End of Borehole									

FICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

ENGINEERING SERVICES BRANCH – GEOTECHNICAL OFFICE – SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 2

WP 36-74-01 LOCATION Co-ords. 15,854,965 N; 963,320 E. ORIGINATED BY VK

DIST 6 HWY Local BORING DATE December 16, 1975 COMPILED BY VK

DATUM Geodetic BOREHOLE TYPE CME (5.1) M.V.H.S. CHECKED BY [signature]

ELEV / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES	GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE)	LIQUID LIMIT W_L, PLASTIC LIMIT W_P, WATER CONTENT W — WATER CONTENT % (10 20 30)	UNIT WEIGHT γ	REMARKS % GR SA SI CL
481.1	Ground Level									
0.0	Het.mix. of clayey silt, sand & gravel (Glacial Till) Hard					480				
			1	SS	43	▼				4 11 64 21
			2	SS	80					
472.1 / 9.0	weathered		3	SS	100/2"					
	sound Shale Bedrock with minor limestone bands. Dark Grey					470				
			4	SS	100/2"					
			5	SS	100/3"					
			6	SS	100/1"					
461.0			7	SS	100/1"					
20.1	End of Borehole									

FICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

ENGINEERING SERVICES BRANCH - GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE Nº 3

WP 36-74-01 LOCATION Co-ords. 15,854,900 N; 963,396 E. ORIGINATED BY VK

DIST 6 HWY Local BORING DATE December 15, 1975 COMPILED BY VK

DATUM Geodetic BOREHOLE TYPE CME (5.1) M.V.H.S. CHECKED BY [illegible]

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH: O UNCONFINED; + FIELD VANE; ● QUICK TRIAXIAL; × LAB VANE

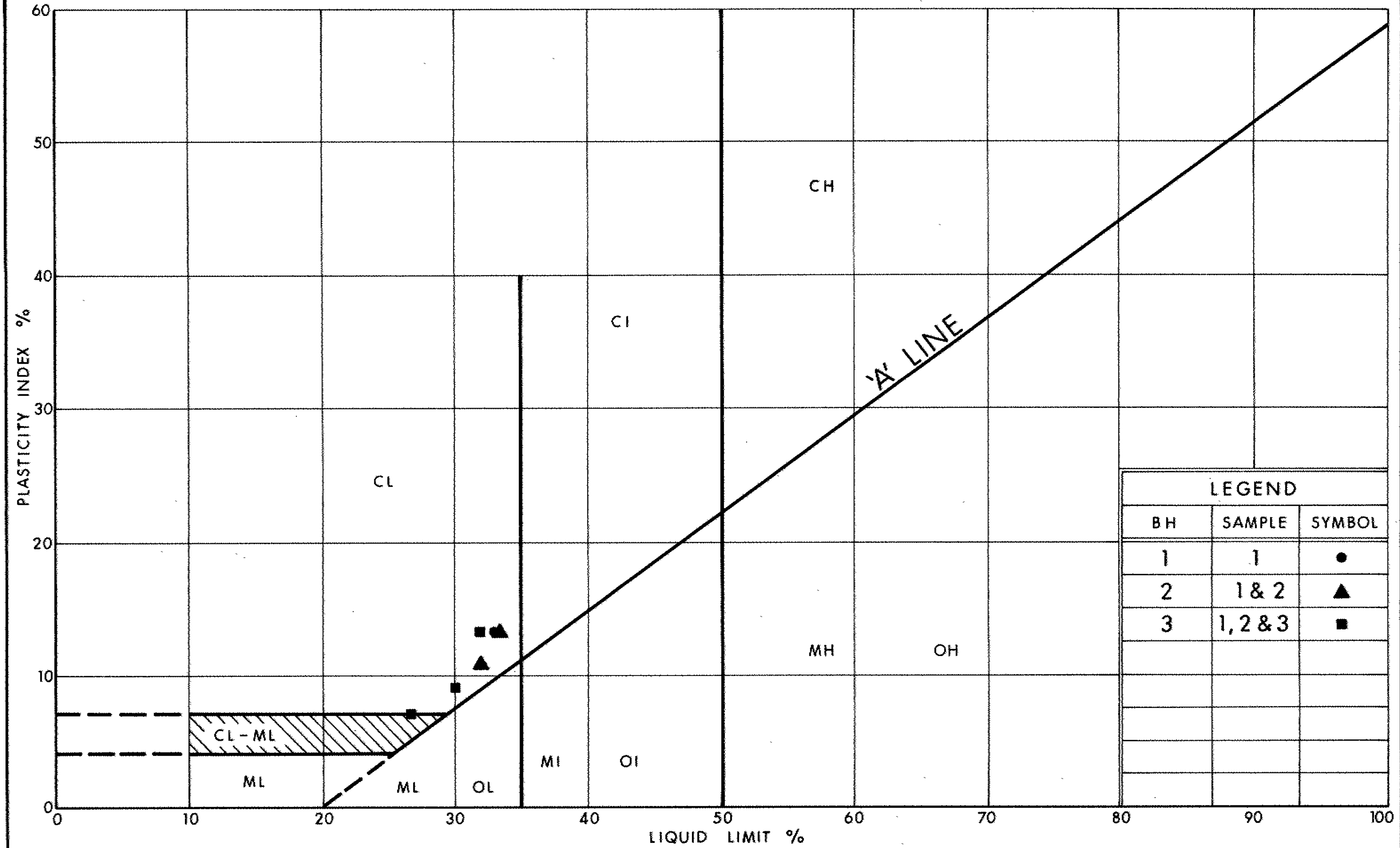
LIQUID LIMIT — W_L; PLASTIC LIMIT — W_P; WATER CONTENT — W

WATER CONTENT %: 10 20 30

UNIT WEIGHT γ

ELEV / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	'N' VALUES	GROUND WATER ELEV	REMARKS % GR SA SI CL
481.7	Ground Level					
0.0	Het.mix. of clayey silt, sand & gravel (Glacial Till)				▼480	
		1	SS	15		28 25 36 11
	Stiff	2	SS	9		5 27 51 17
471.7		3	SS	80		
469.7 / 12.0	weathered				470	
	sound Shale Bedrock with minor limestone bands. Dark Grey	4	BXL	Rec 60%		
461.7		5	BXL	Rec 95%		
20.0	End of Borehole					

FICE REPORT ON SOIL EXPLORATION

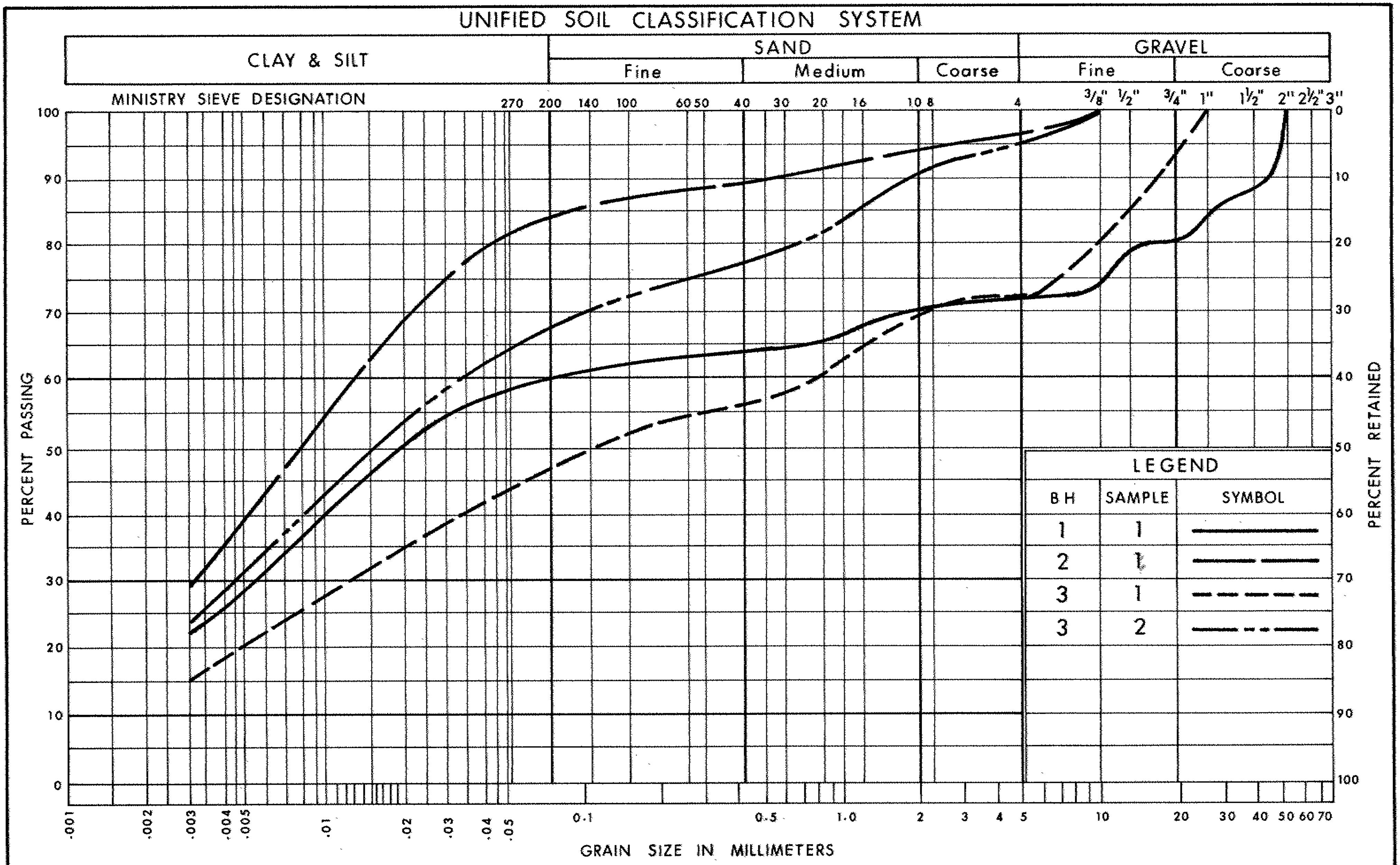


Ministry of Transportation and Communications
Ontario
ENGINEERING SERVICES BRANCH

PLASTICITY CHART
HET MIXTURE OF
CLAYEY SILT, SAND & GRAVEL (Glacial Till)

FIG No 1

W P 36-74-01



Ministry of Transportation and Communications Ontario ENGINEERING SERVICES BRANCH	GRAIN SIZE DISTRIBUTION HET MIXTURE OF CLAYEY SILT, SAND & GRAVEL (Glacial Till)	FIG No 2 W P 36-74-01

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION RESISTANCE

'N'= STANDARD PENETRATION RESISTANCE : - 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 :-

CONSISTENCY	c LB./SQ.FT.
VERY SOFT	0 - 250
SOFT	250 - 500
FIRM	500 - 1000
STIFF	1000 - 2000
VERY STIFF	2000 - 4000
HARD	> 4000

DENSENESS	'N' BLOWS / FT.
VERY LOOSE	0 - 4
LOOSE	4 - 10
COMPACT	10 - 30
DENSE	30 - 50
VERY DENSE	> 50

TERMS TO BE USED IN DESCRIBING SOILS:-

TRACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC.

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.T.	SLOTTED TUBE SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V.	FIELD VANE
CIU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

FF-A-24(b) (Rev. Jan. 73)

ABBREVIATIONS & SYMBOLS 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
w_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 } IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION } IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION } IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION } IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
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 (YOUNGS MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

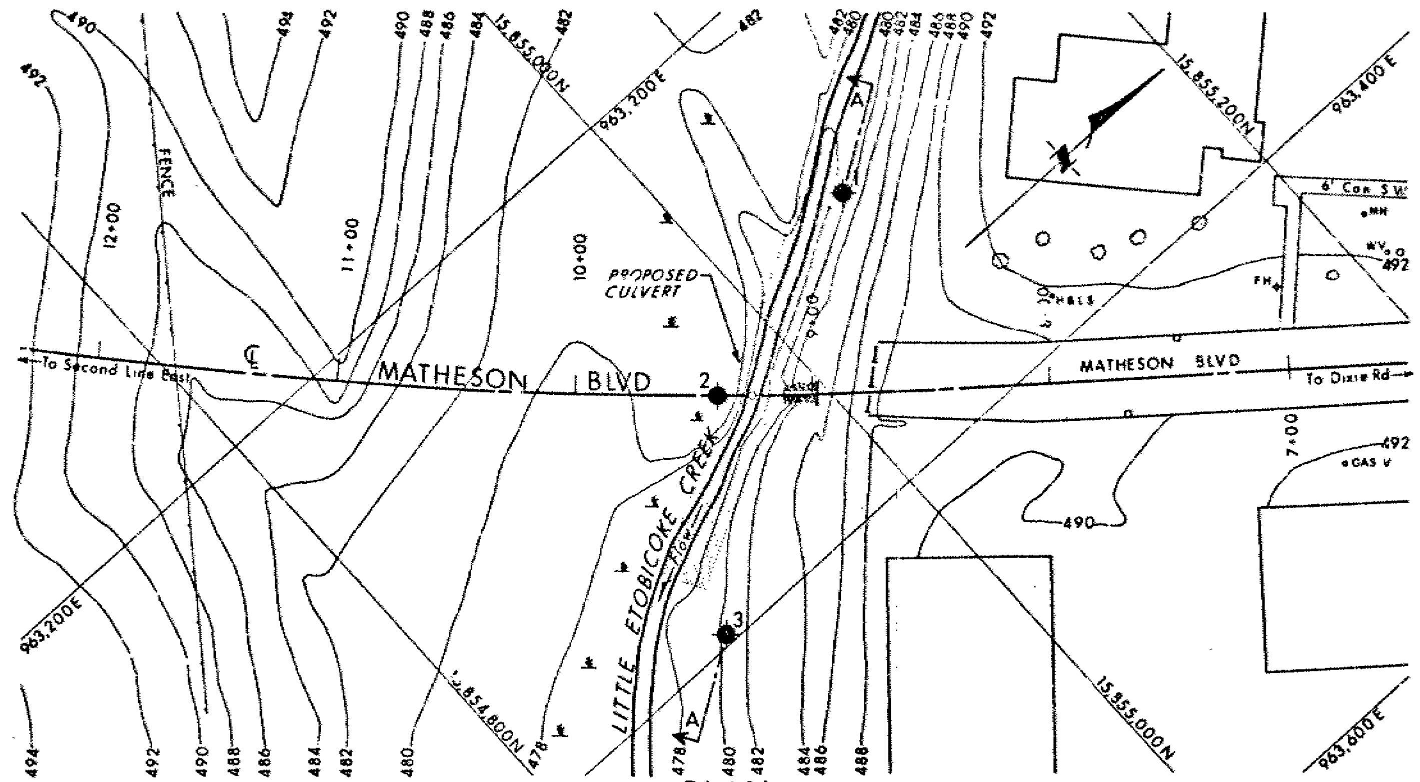
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

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

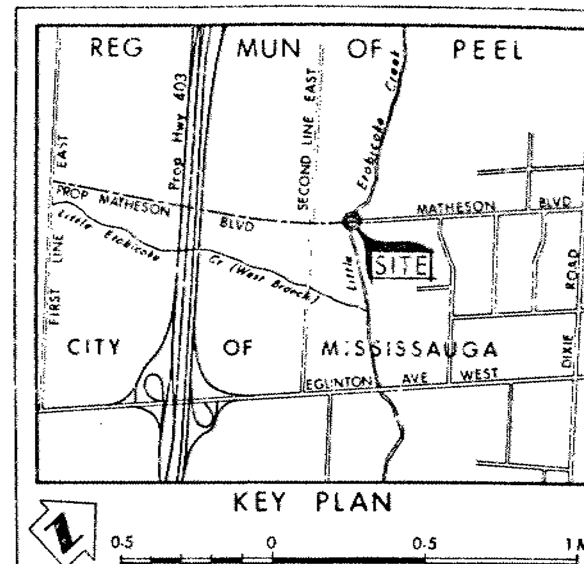
SLOPES

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



PLAN

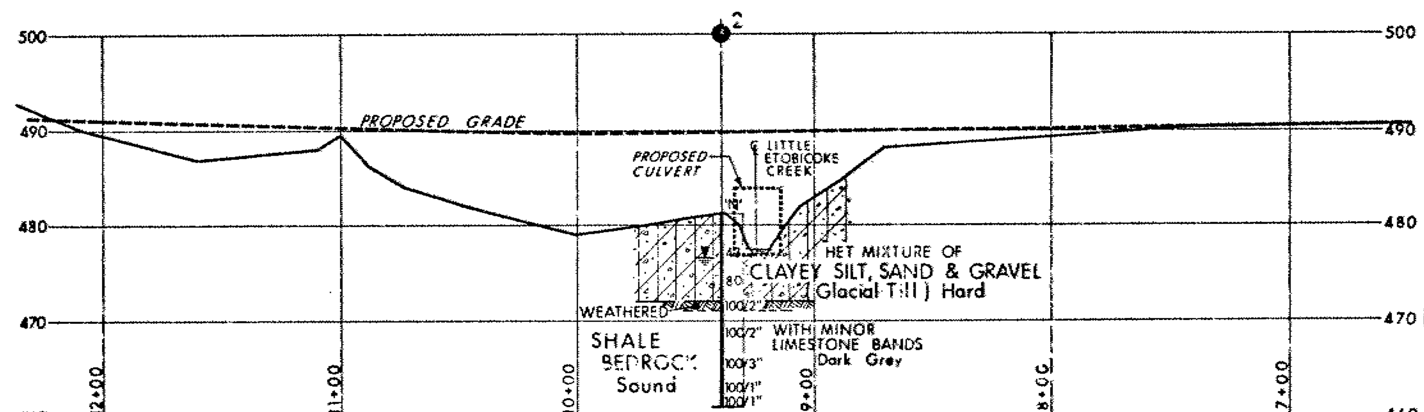
SCALE 40 20 0 40 80 FT



LEGEND

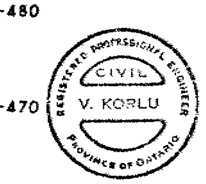
- Bore Hole
- Dynamic Cone Penetration Resistance Test B/F CONE - Blows/Ft. Cone Test (350 ft lbs. energy/blow)
- Bore Hole & Cone Test
- Water Levels established at time of field investigation. Dec 1975

NO.	ELEVATION	CO-ORDINATES NORTH	CO-ORDINATES EAST
1	481·5	15,855,060	963,291
2	481·1	15,854,965	963,320
3	481·7	15,854,900	963,396

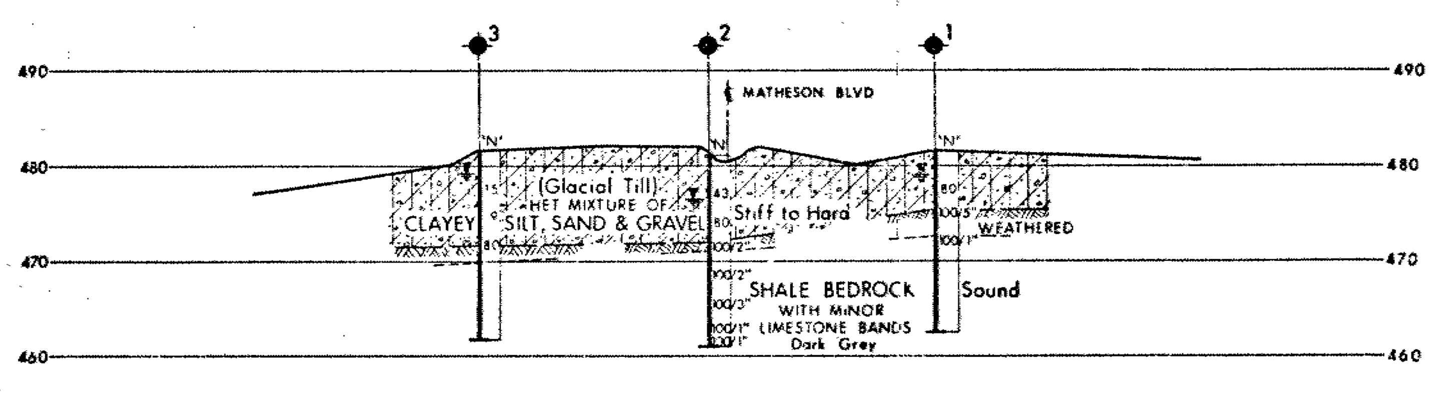


℄ PROFILE MATHESON BLVD

SCALE HOR 40 20 0 40 80 FT
VERT 10 5 0 10 20 FT



— NOTE —
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.



SECTION A-A

SCALE HOR 40 20 0 40 80 FT
VERT 10 5 0 10 20 FT

REF No FENCO Dwg No 3983-10T-5 ; Sept 12, 1975

REVISIONS	DATE	BY	DESCRIPTION

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

LITTLE ETOBICOKE CREEK CULVERT

HIGHWAY NO MATHESON BLVD EXTENSION DIST. NO 6
Reg Mun of PEEL City of MISSISSAUGA
TWP LOT CON

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD V.K.	CHECKED	W.P. NO 36-74-01	DRAWING NO 367401-A
DRAWN	CHECKED	W.O. NO	
DATE Feb 25, 1976		SITE NO	BRIDGE DRAWING NO
APPROVED		CONT NO	

Mr. G.C.E. Burkhardt,
Reg. Structural Planning Engineer,
Structural Planning Office,
Central Region, Toronto.
Mr. R.A. Jeffries.

Soil Mechanics Section,
Geotechnical Office,
West Building, Downsview.
January 10th, 1975.

W.P. 33-74-00 36-74-01

your memo of Jan. 2/75.

RE: Proposed Hwy. 7 & 12/C.P.R. Crossing,
Myrtle Station.

We have examined the information provided in Mr. S. Wilson's memorandum of November 22nd, 1974, and Sketch No. 1 dated September 24th, 1974, which were attached to your request. The following comments can be made at this time without further site investigations:

1. For the overhead scheme and using the borehole data from the "Borehole at Proposed Subway Site", structure foundations must be supported on piles. 45' long timber piles should develop 25 t.s.f. at abutment locations; 15 t.s.f. at pier locations, if driven 25 ft. below existing grade. For larger capacity piles, the available information is inadequate since refusal elevations cannot be determined from the data given. Hence allowable loads cannot be determined.

2. For the indicated subway grade, an allowable bearing pressure of up to 3 t.s.f. can be used for spread footings located within the "very dense clayey silt till".

3. The borehole illustrated as "Borehole at Proposed Subway Site" indicates the presence of several seepage zones both above and within the till deposit. Since no groundwater level observations were made at the site and since the seepage zones above the till deposit have been inferred from "drill behaviour" rather than actual measurements with piezometers, the drawdown characteristics in this area cannot be accuratetly predicted. The seepage noted within the till is in a "silt" seam. This indicates a "glacio-fluvial" till deposit. Such deposits are interspersed with interglacial lenses, seams and isolated and connected reservoirs of water bearing sands and silts which may or may not be subject to artesian heads. Uncontrolled, these can cause bottom heave and blow-ups during excavation. Therefore, a careful hydro-geologic mapping will be necessary to ascertain the complexity and cost of a permanent dewatering scheme for the subway proposal.

..... /2

O.W.R.C. groundwater information indicates that in Concession IX, East Whitby Township, water wells for domestic and stock use are being charged at the 5 to 20 ft. depths. (Also recorded is one well which encountered water at the 350 ft.-depth!)

A subway scheme, therefore: -

(i) may require permanent dewatering to handle possibly relatively large volumes of groundwater flow,

and

(ii) such dewatering may render useless nearby domestic water wells.

If the information provided in this memorandum is insufficient for your preliminary costing and comparison purposes, please schedule and request a foundation investigation in the usual manner.

C. Mirza,
Head, Soil Mechanics Section.

CM/mj
c.c. R.D. Gunter
(attn: S. Wilson),
R.G. Burnfield
(attn: I. Weinberg).

Files
Documents

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO

MEMORANDUM

TO: Mr. C. Mirza,
Head Soils Mechanics Section,
Geotechnical Office,
WEST Building .

ATTENTION:

FROM: Materials and Testing Office,
Central Region.

DATE: January 9, 1975.

OUR FILE REF.

IN REPLY TO

SUBJECT: Preliminary Soils Investigation, W.P. 32-74-00
Highway 7 and 12, Myrtle Station

Further to our conversation and so there will be no misunderstanding of the purpose for the borings carried out on this project, the following are the facts as I know them:

1) The scope of the investigation was of the most preliminary nature. The requirements consisted of a borehole placed in the general vicinity of the proposed subway in order that we might inform the Regional Systems Office if ground water conditions would preclude the presentation of a subway as a viable alternative scheme to an overhead structure at the public presentation. This scope of investigation also holds true for the railway relocation.

   Under no circumstances could Mr. S. Wilsons' memo be construed as a foundation report and I am sure you are well aware of that fact.

2) This Office contacted the Soils Mechanics Office with regards to this matter prior to the work being carried out. Mr. Wilson, Project Soils Engineer spoke with both yourself and Mr. M. Devatta, Supervising Engineer about the problem and requested the work be carried out by your Office. However, due to your work load and the time constraints, it was not possible for your people to meet the proposed time schedule so Mr. S. Wilson carried out the assignment under the supervision of this Office. With the above contact with your Office in mind, I find it difficult to understand why no one seems to recall that a structure was involved.

3) As to the "Conclusions and Recommendation" portion of Mr. Wilsons' memo, they were agreed to by Mr. H. Elston, Acting Senior Soils Supervisor and myself in principal. However, the second last paragraph should be changed to read "If the subway scheme is to be proceeded with further, the Soils Mechanics Office should be contacted for a detailed investigation and subsequent recommendations".

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From our conversation on this matter I got the distinct feeling that you think the Regional Materials Office overstepped its authority and technical expertise in producing the aforementioned memo especially with regards to the "Conclusions and Recommendations" portion. May I again point out that your Office was contacted and that information in the memo was intended only to confirm or deny the presentation of a subway to the public as a viable alternative to other schemes being mentioned.

Should you wish to discuss this further please contact this Office at your convenience.

R.D. Gunter,
Regional Materials Supervisor.

RDG/daf

c.c. R.G. Gascoyne
M. Devatta
G. Burkhardt
I. Weinberg

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. R.G. Burnfield,
Reg. Highway Design Engr.,
Reg. Systems Design Office,
Central Region.

FROM: Materials and Testing Office,
Central Region.

ATTENTION: I.Weinberg

DATE: November 22, 1974.

OUR FILE REF.

IN REPLY TO

SUBJECT: Hwy. 7 and 12 and C.P.R. Crossing at Myrtle Station
W.P. 33-74-00

A preliminary investigation of the soil and groundwater conditions has been carried out for two suggested schemes of improvement. These are, relocating the highway westward with a subway structure and relocating the railway which will involve a long deep cut, to the north of Myrtle Station.

Physiography

The area lies within a till plain called the South Slope. Approximately one mile to the north is the sandy crescent of the Oak Ridges Moraine.

Investigation

Using a 3¼" hollow stem auger, one test hole was placed approximately 60' south of the railway tracks and 75' west of the highway in the area of the proposed subway. Here, the soil was found to consist of 2' of topsoil, 4' of loose brown sand, 6' of compact gravelly sandy loam overlying dense to very dense grey clayey silt till. Four layers of wet material or seepage zones were encountered. Although the hole remained dry during the drilling operation, shortly after, the drill stems had been removed, free water accumulated in the hole.

In the vicinity of Myrtle Station, many of the water wells are shallow being approximately 40' deep. Two adjacent well owners west of Mud Lake Road and immediately south of the railway were interviewed to confirm and supplement the available well logs.

Railway Relocation

For the second scheme of relocating the railroad, a test hole was placed on the highway right of way. Where the suggested realignment crosses the highway, a cut would consist of 10' of loose wet to moist brown sandy silt, 9½" of very dense greyish brown moist sand over 6' of very dense sandy silty gravel. No free water was encountered in the 25' boring depth.

Conclusion and Recommendations

At Highway 7 and 12 in the location suggested for relocating the railway, the material is competent to support any required structure. Although no free water was encountered at this location, owing to the length and depth of the cut, interception of several seepage zones with corresponding adverse affects on groundwater to the south is anticipated.

In addition to the groundwater, a considerable volume of surface water will have to be provided for. Surface runoff, water from roadside ditches and the flow of three small creeks will have to be diverted around or conveyed across the cut.

Diversion will upset existing drainage patterns and groundwater conditions. Conveying the water across the cut will involve elaborate structures such as inverted siphons.

The more acceptable scheme from the soils point of view is the relocation of the highway and the construction of a subway. A permanent drainage system would be required to handle groundwater in addition to surface runoff unless the water bearing strata could be completely sealed off. This is considered unlikely, although desirable with respect to the surrounding shallow water wells. An estimated 15 to 18 wells within a 1000' to 1200' radius of the site, including wells fed from strata lower than the pending subway excavation, are liable to be affected by drainage of the upper water bearing strata.

Over the two schemes, a third scheme relocating the highway around Myrtle Station would be preferred.

If the subway scheme is to be proceeded with further, this office should carry out a visual inspection of the seepage problem by means of a test pit.

This is what they were supposed to do in the first place!

To fairly deal with claims arising from constructing a subway, a program of monitoring groundwater levels should be started as early as possible.

S. G. Wilson

S. G. Wilson,
Project Soils Engineer.

SGW/HE/nc For: H. Elston,
Acting Senior Soils Supervisor.

c.c.: H. Greenland

[illegible]REHOLE AT PROPOSED SUBWAY [illegible]E