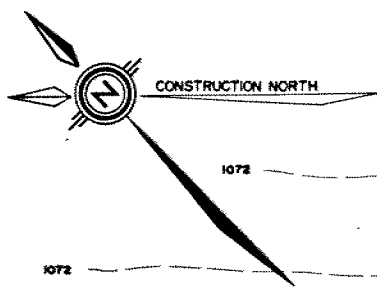


REMARKS: _____



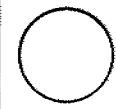
CONT No
WP No. 98-75-02

COLLEGE AVE. OVERPASS (N.B.L.)
GENERAL ARRANGEMENT

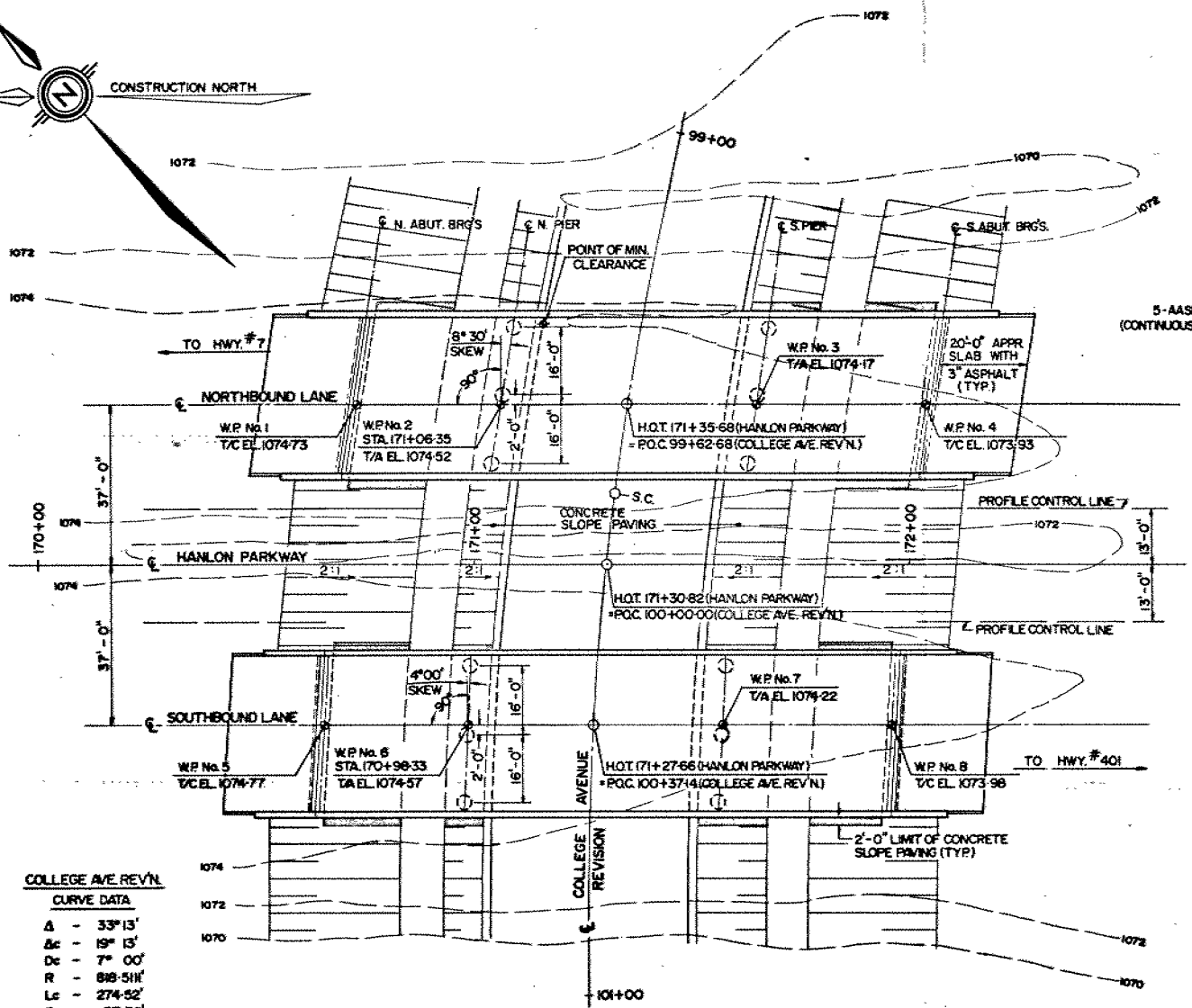
HIGHWAY No. 6N DISTRICT No. 3



totten sims hubicki associates limited
CONSULTANTS



SHEET



COLLEGE AVE. REV. N

CURVE DATA

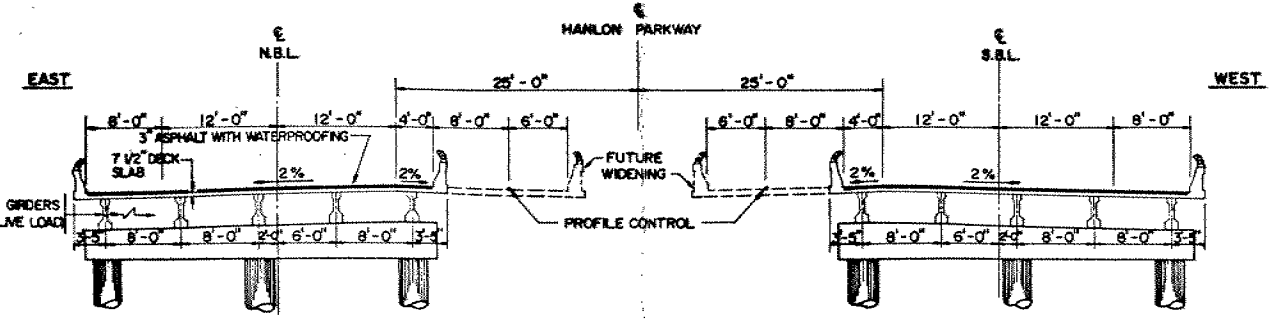
Δ	33° 13'
Δc	19° 13'
Δs	7° 00'
R	888.51'
Lc	274.52'
Es	37.76'

SPIRAL DATA

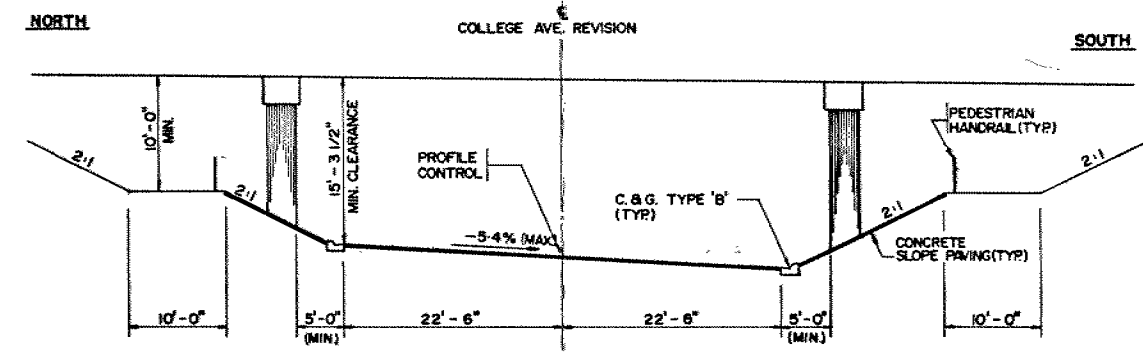
Δs	7° 00'
Ls	200'
Ts	344.70'

PLAN
SCALE: 1" = 20'-0"

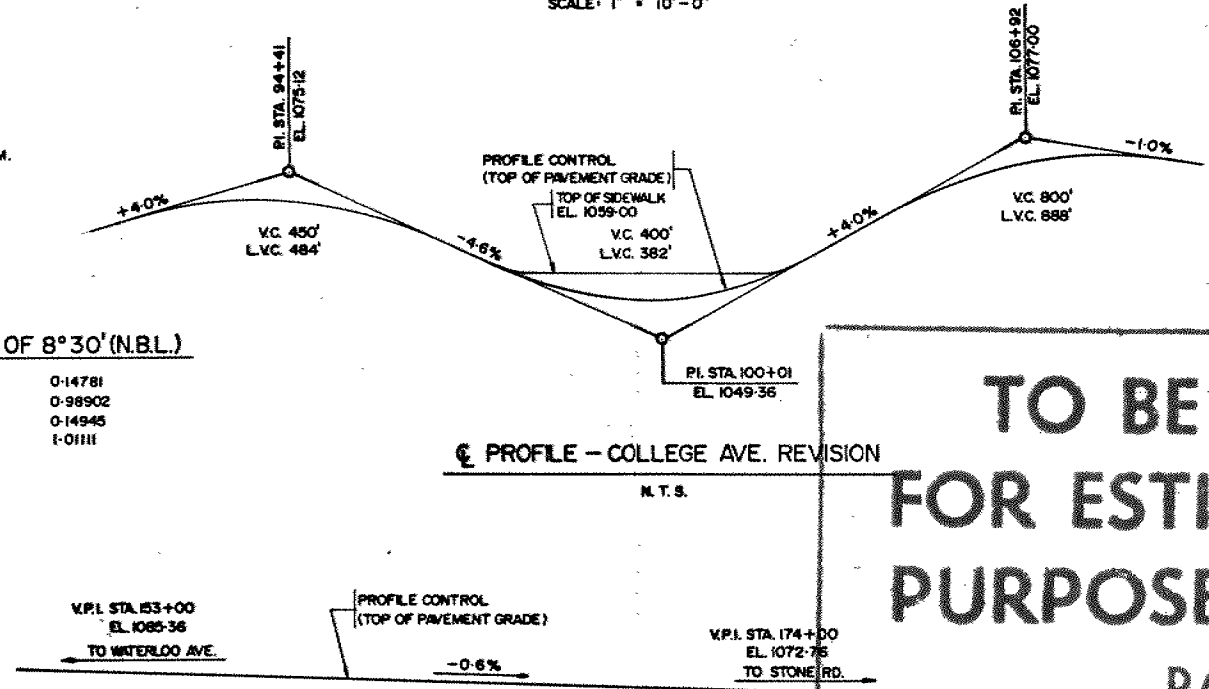
- NOTES:
- W.P. DENOTES WORKING POINT.
 - T/A DENOTES TOP OF ASPHALT WEARING SURFACE.
 - T/C DENOTES TOP OF CONCRETE DAM.
 - N.B.L. DENOTES NORTHBOUND LANE.
 - S.B.L. DENOTES SOUTHBOUND LANE.



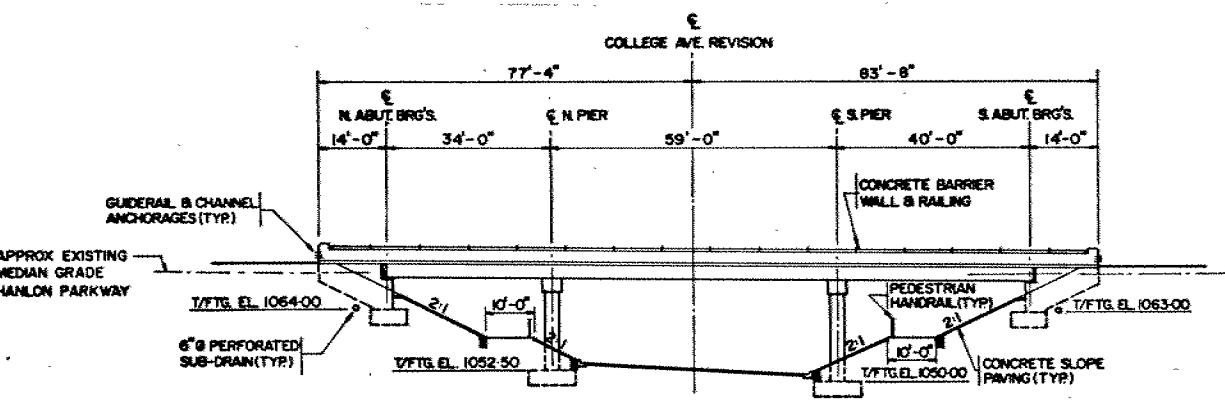
HANLON PARKWAY - TYPICAL BRIDGE SECTION
SCALE: 1" = 10'-0"



COLLEGE AVE. REVISION - TYPICAL SECTION
SCALE: 1" = 10'-0"



PROFILE - COLLEGE AVE. REVISION
N.T.S.



ELEVATION
SCALE: 1" = 20'-0"

D.H.Q. B.M. 129-69 Elev. 1074.15
TABLET IN NORTH FACE OF F.H.B. JCT.
COLLEGE AVE. & HANLON PARKWAY 213'
LT. OF STA. 104+56 (COLLEGE AVE.)
RESIDENCE OF J. FRAZER.

FUNCTIONS OF 8° 30' (N.B.L.)

SIN.	0.14781
COS.	0.98902
TAN.	0.14945
SEC.	1.01111

PROFILE OF HANLON PARKWAY
N.T.S.



TO BE USED
FOR ESTIMATING
PURPOSES ONLY
DATE JUN 30 1976

NOTES:

CLASS OF CONCRETE

• PIERS, DECK, DIAPHRAGMS & BARRIER WALLS	4,000 P.S.I.
• PRESTRESSED GIRDERS	5,000 P.S.I.
• REMAINDER	3,000 P.S.I.

CLEAR COVER TO REINFORCING STEEL

• FOOTINGS, ABUTMENTS & WINGWALLS	3"
• PIERS	2"
• DECK	1" BOT., 2" TOP
• APPROACH SLABS	2"
• CONCRETE BARRIER WALLS	1 1/2"
• GIRDERS	1"

CONSTRUCTION NOTES

- THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF $\pm 1/8"$.
- NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.
- TO ACHIEVE THE MINIMUM CLEAR COVER OF 2" SPECIFIED, THE TOP LAYER OF REINFORCING STEEL IN THE DECK SLAB SHALL BE PLACED PRIOR TO CONCRETING WITH A CLEAR COVER OF $2 1/2" \pm 1/2"$ TOLERANCE.
- REINFORCING STEEL SHALL BE IN ACCORDANCE WITH C.S.A. G30-2 GRADE 50 EXCEPT REINFORCING STEEL IN COLUMNS SHALL BE GRADE 60.

CONCRETE QUANTITIES

CONCRETE QUANTITIES ARE LISTED BELOW FOR THE APPROPRIATE CONCRETE LUMP SUM TENDER ITEMS.	
• CONCRETE IN PIERS, ABUTMENTS & WINGWALLS	31 CU. YD. 3,000 P.S.I.
• CONCRETE IN DECK & DIAPHRAGMS	43 CU. YD. 4,000 P.S.I.
• CONCRETE IN BARRIER WALLS	150 CU. YD.
• CONCRETE IN APPROACH SLABS	29 CU. YD.
• CONCRETE IN SLOPE PAVING	45 CU. YD.
	64 CU. YD.

LIST OF DRAWINGS

- 35-420A-1 - GENERAL ARRANGEMENT.
- 2 - BOREHOLE LOCATIONS & SOIL STRATA.
- 3 - FOOTINGS.
- 4 - ABUTMENTS.
- 5 - WINGWALLS.
- 6 - PIERS.
- 7 - PRESTRESSED GIRDERS & BEARINGS.
- 8 - DECK DETAILS.
- 9 - CONCRETE BARRIER WALL (2'-8" HIGH).
- 10 - 20' APPROACH SLAB FOR BARRIER WALL.
- 11 - CONCRETE SLOPE PAVING.
- 12 - STEEL PARAPET RAILING (SINGLE TUBE).
- 13 - STANDARDS.
- 14 - STANDARDS.
- 15 - AS CONSTRUCTED ELEV. & DIM.

SCALE AS NOTED

FOR REDUCED PLAN
USE SCALE BELOW



REVISIONS	DATE BY	DESCRIPTION

DESIGN	T.M.	CHECK	E.V.	LOADING	H.S. 20-44	DATE	MAY 1976
DRAWING	T.M.	CHECK	G.L.A.	SITE	No. 35-420A	DWG	1

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

40P9-20
SECRET No.

TO: A.P. Watt (2)
Regional Structural Planning Engineer
Southwestern Region, London

FROM: Soil Mechanics Section
Geotechnical Office
West Bldg.

ATTENTION:

DATE: January 16, 1976

JAN 20 1976

OUR FILE REF.

IN REPLY TO

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For

W.P. 98-75-02
Site No. 35-420
Hanlon Expressway, Dist. 3
College Avenue Overpass
0.7 Miles South of the Speed River

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.

K. G. Selby

K.G. Selby
Supervising Engineer

KGS/bp

cc: R.S. Pillar
R.A. Dorton
B.J. Giroux
G.A. Wrong
A. Wittenberg
J.R. Roy
F.C. Brown
R. Hore
J. Anderson)
A. Crowley)
G. Sloan)
Files
Record Services

Memo only

TABLE OF CONTENTS

1. INTRODUCTION

2. SITE DESCRIPTION

3. SUBSOIL

3.1 General

3.2 Sand and Gravel

3.3 Fine Sand to Clayey Silt

3.4 Clayey Silt with Sand (Glacial Till)

3.5 Limestone Bedrock

3.6 Groundwater

4. DISCUSSION AND RECOMMENDATIONS

4.1 General

4.2 Spread Footings

4.3 H-Piles

4.4 Dewatering

4.5 Frost Protection

FOUNDATION INVESTIGATION REPORT

For

W.P. 98-75-02

Site No. 35-420

Hanlon Expressway, Dist. 3

College Avenue Overpass

0.7 Miles South of the Speed River

1. INTRODUCTION

This report is for the design and construction of the proposed structure and its approaches at the above mentioned site. The subsoil information is based on eight sampled boreholes and the observation of a trench dug for utilities to the north of the site.

2. SITE DESCRIPTION

The proposed site is in the city of Guelph some 200 ft. north of the present intersection of College Avenue and the Hanlon Expressway.

The immediate area surrounding the site is a gently rolling granular terrace stretching between and partially burying some neighboring drumlins.

Urban development of the area is proceeding rapidly except for the North West quadrant which is owned by the Gypsum Company of Canada and contains their quarry which is situated approximately $\frac{1}{2}$ mile from the site.

3. SUBSOIL

3.1 General

The subsoil consists of 23 to 30 ft. of bedded sands and gravels laid down when the valley formed a large glacial spillway. Beneath this layer there is 5 to 10 ft. of fine grained material

ranging from fine sand to clayey silt. This layer is in turn underlain by a glacial deposit of 15 to 20 ft. of clayey silt with sand and a trace of gravel. Beneath this some 50 ft. below the surface is limestone bedrock.

3.2 Sand and Gravel

The 23 to 30 ft. of sand and gravel in this layer was laid down in beds by a much larger river which occupied the valley of the Speed in the immediate post glacial period. The deposit is well graded (Fig. 1) with Standard Penetration 'N' values ranging from 20 to in excess of 50, indicating a relative density ranging from compact to very dense. The moisture content is very low being less than 5 per cent.

3.3 Fine Sand to Clayey Silt

This layer which varies from 5 to 10 ft. in thickness consists of fine grained material. The western portion of the deposit shows a low degree of cohesiveness and a very stiff consistency. The eastern portion is generally non-cohesive consisting of up to 70% fine sand with most of the remainder being silt. The relative density of this portion of the deposit ranges from compact to dense with Standard Penetration 'N' values ranging from 20 to 54.

3.4 Clayey Silt with Sand (Glacial Till)

This deposit which is 15 to 20 ft. in thickness exhibits a low degree of plasticity. It contains large quantities of sand ranging up to 50% as well as a trace of gravel (typical grain size curves shown in Fig. 2). Consistency is generally very hard with Standard Penetration 'N' values being in excess of 100 blows per ft. The exception to this is in a shallow upper zone of the deposit which has been softened by groundwater. Moisture content for the lower portion of the deposit is generally less than 10%.

3.5 Limestone Bedrock

Limestone bedrock was encountered at a depth of approximately 50 ft. It has a relatively flat surface with only a shallow weathered zone at the surface.

3.6 Groundwater

Groundwater was encountered at approximate elevation 1030.

4. DISCUSSION AND RECOMMENDATIONS

4.1 General

It is proposed to replace the present at grade intersection of College Avenue and the Hanlon Expressway with an overpass in which the grade of College Avenue is depressed to pass under the Hanlon Expressway. This will necessitate the construction of a structure with a single 75 ft. span to carry the Hanlon Expressway over College Avenue. Retaining walls parallel to College Avenue will also be required to support sidewalks at a higher grade than that of the road.

4.2 Spread Footings

It is recommended that the structure and retaining walls be supported on spread footings. If these footings are founded at or above elevation 1050 a design load of 3 tons per sq. ft. should be employed. For computation of sliding resistance a friction coefficient of 0.5 may be assumed to apply between the base of the footing and the underlying subsoil. Total settlement, which will take place as the load is applied should not exceed 1 inch.

The coefficient of active earth pressure (k_a) for the design of the abutments can be taken as 0.33. The retaining walls on either side of the structure with a cut slope behind them should be designed using a k value of 0.4.

4.3 H-Piles

As an alternative the footings may be supported on steel H-Piles driven to bedrock at approximate elevation 1015. In this case the piles may be loaded to the allowable structural capacity of the particular section chosen.

4.4 Dewatering

No dewatering problems are anticipated as the footings will be above the present groundwater level which is at 1030.

4.5 Frost Protection

All pile caps or spread footings should be protected against frost action by a minimum 4 ft. of cover.



A handwritten signature in black ink, appearing to read "Peter Stuart".

Peter Stuart
Project Engineer

A handwritten signature in black ink, appearing to read "K.G. Selby".

K.G. Selby
Supervising Engineer

APPENDIX

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

RECORD OF BOREHOLE NO 1

WP 98-75-02

LOCATION Sta. 97+81 o/s 30' Lt. College Ave. Revision

ORIGINATED BY PJS

DIST 3 HWY 6N

BORING DATE December 4, 1975

COMPILED BY PJS

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_P	W	W_L		
1072.1	Ground Level															
0.0	Sand and Gravel					1070										
	Compact to Very Dense		1	SS	32											23 71 (6)
			2	SS	35	1060										
			3	SS	28											12 83 (5)
			4	SS	56	1050										
1047.1			5	SS	20											14 34 44 8
25.0	Fine sand & silt, trace		6	SS	23											
	of gravel and clay.		7	SS	54											
	Compact to Very Dense		8	SS	42	1040										1 69 (30)
1037.1			9	SS	100	8"										
35.0	Clayey silt with sand		10	SS	100	8"										
	trace of gravel															
	(Glacial Till)															
	Hard															
1019.0						1020										
53.1	End of Borehole															
	Probable Bedrock															

RECORD OF BOREHOLE NO 2

WP 98-75-02

LOCATION Sta. 98+87 o/s 25' Rt. College Ave, Revision

ORIGINATED BY PJS

DIST 3 HWY 6N

BORING DATE November 26, 1975

COMPILED BY PJS

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY *ep.*

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

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3

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

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

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

RECORD OF BOREHOLE NO 4

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

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_p WATER CONTENT W			UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_p	W	W_L		
1071.4	Ground Level															
0.0	Sand and Gravel					1070										
	Compact to Very Dense		1	SS	30	1060										9 86 (5)
			2	SS	40/5"											
			3	SS	40	1050										
			4	SS	34											
			5	SS	39											
1039.4			6	SS	63	1040										37 57 (6)
32.0	Clayey silt		7	SS	50											
1035.4	Very Stiff															
36.0	Sand and gravel		8	SS	50											
1031.4	Dense															
40.0	Clayey silt with sand					1030										
1027.9	traces of gravel (Glacial Till) Hard		9	SS	100/7"											
43.5	End of Borehole															
	Note: Water Level not established.															

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

RECORD OF BOREHOLE NO 5

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

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

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

RECORD OF BOREHOLE NO 6

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

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_P	W	W_L		
1073.7	Ground Level															
0.0	Sand and Gravel					1070										
	Compact to Very Dense		1	SS	12	1060										
			2	SS	27											31 66 (3)
			3	SS	43	1050										
			4	SS	58											
			5	SS	30											
			6	SS	42											36 59 (5)
1040.7	Clayey silt		7	SS	29	1040										
33.0	Very Stiff		8	SS	14											
			9	SS	19											
1030.7	Fine sand					1030										
43.0	Very Dense		10	SS	78											
1027.2																
46.5	End of Borehole															

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

RECORD OF BOREHOLE NO 7

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

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

RECORD OF BOREHOLE NO 8

WP 98-75-02

LOCATION Sta. 102+10 o/s 35' Rt. 6 College Ave. Revision

DIST 3 HWY 6N

BORING DATE December 3, 1975

ORIGINATED BY PJS

DATUM Geodetic

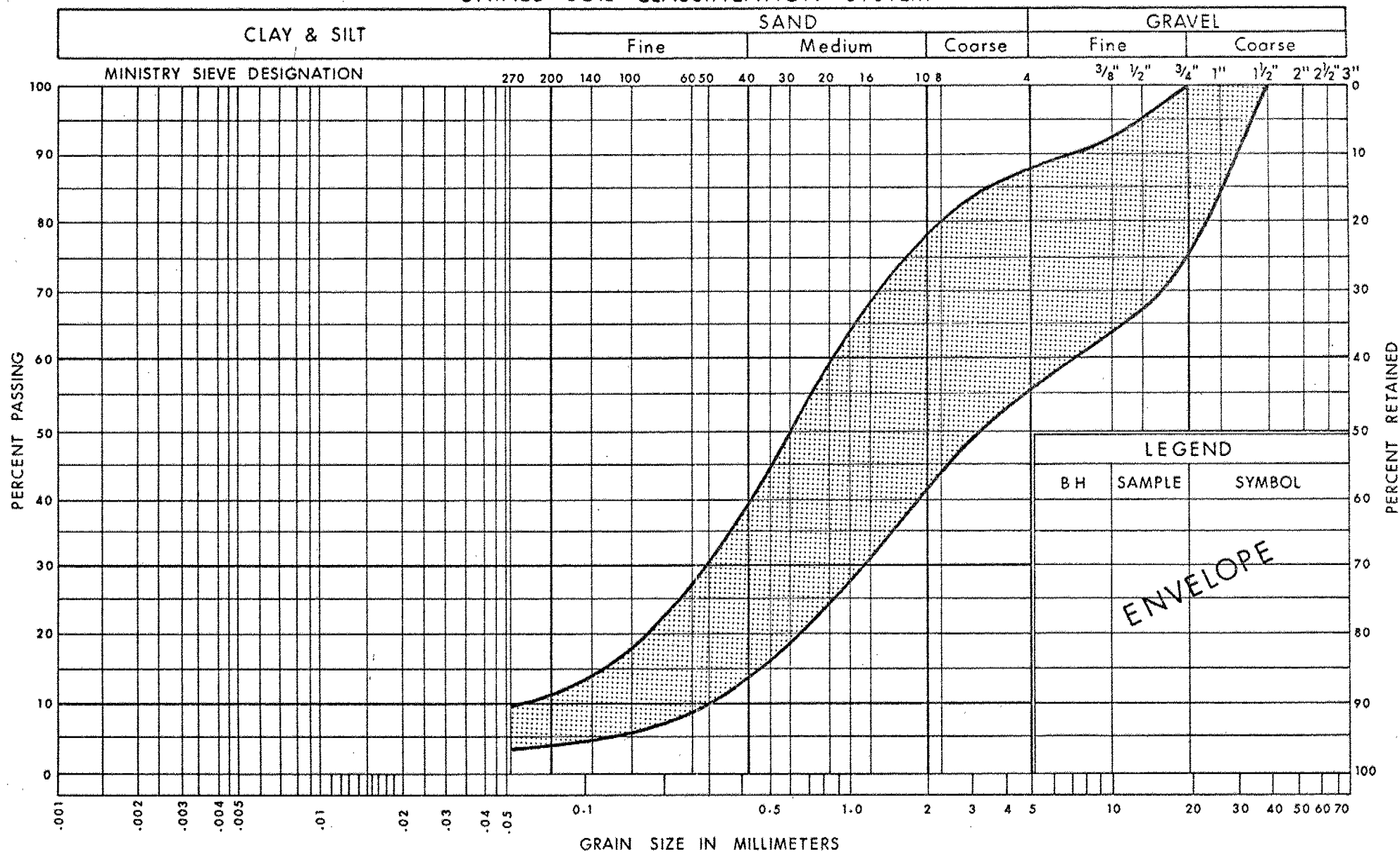
BOREHOLE TYPE Hollow Stem Auger

COMPILED BY PJS

CHECKED BY *ep.*

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

UNIFIED SOIL CLASSIFICATION SYSTEM



Ontario
ENGINEERING SERVICES BRANCH

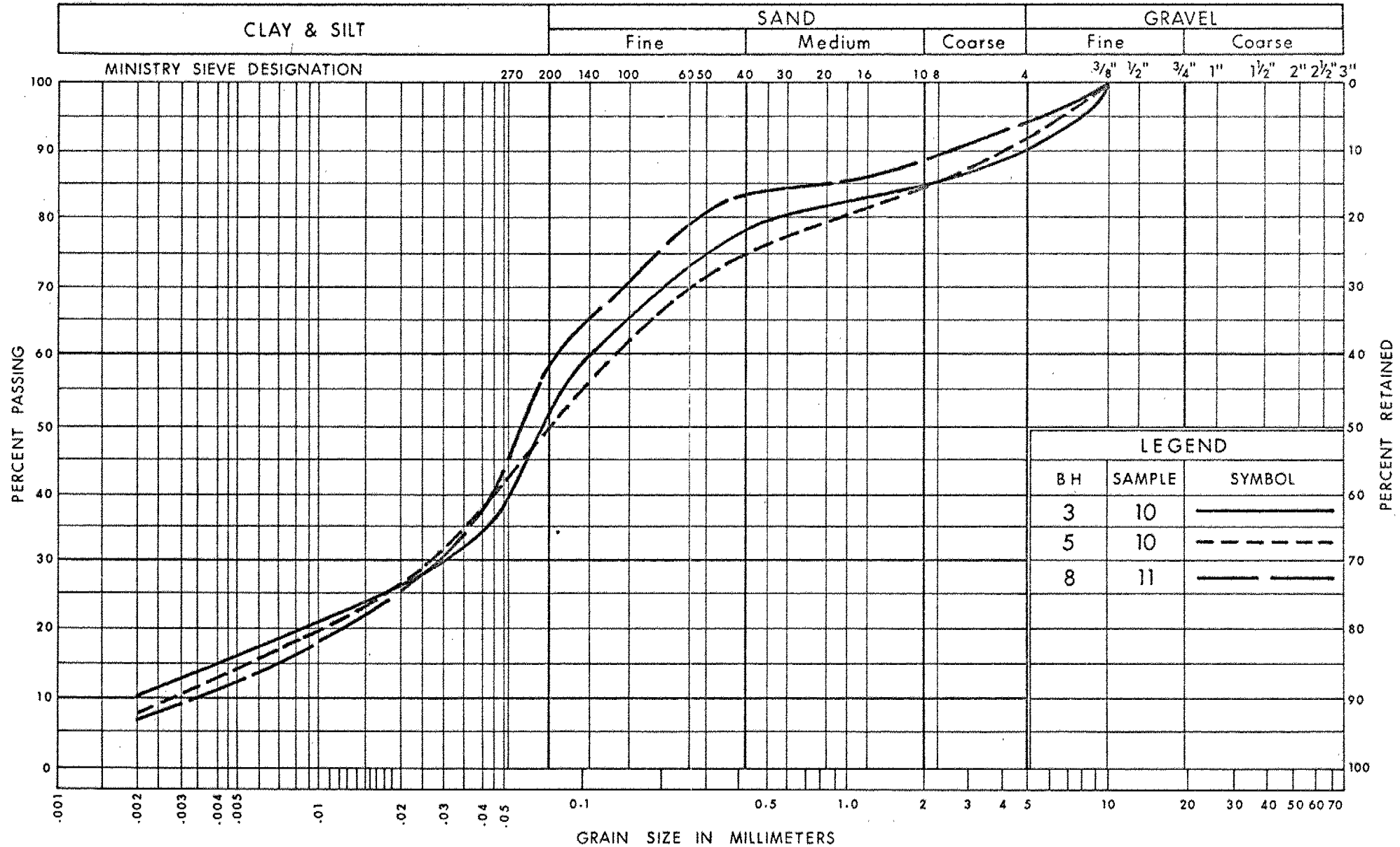
Ministry of
Transportation and
Communications

GRAIN SIZE DISTRIBUTION SAND & GRAVEL

FIG No 1

WP 98-75-02

UNIFIED SOIL CLASSIFICATION SYSTEM



Ontario
ENGINEERING SERVICES BRANCH

Ministry of
Transportation and
Communications

GRAIN SIZE DISTRIBUTION
CLAYEY SILT (GLACIAL TILL)
WITH SAND, TRACE OF GRAVEL

FIG No 2

W P 98-75-02

ABBREVIATIONS & SYMBOLS USED IN THIS REPORTPENETRATION 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:-

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

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 "		

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_t	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_i	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
$\bar{\sigma}$	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

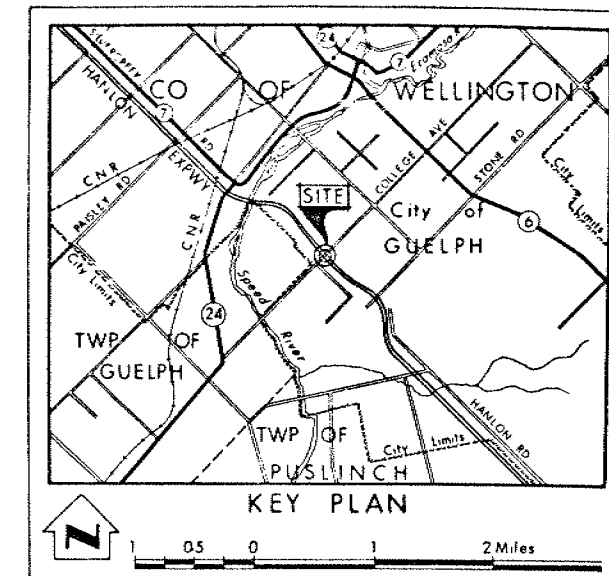
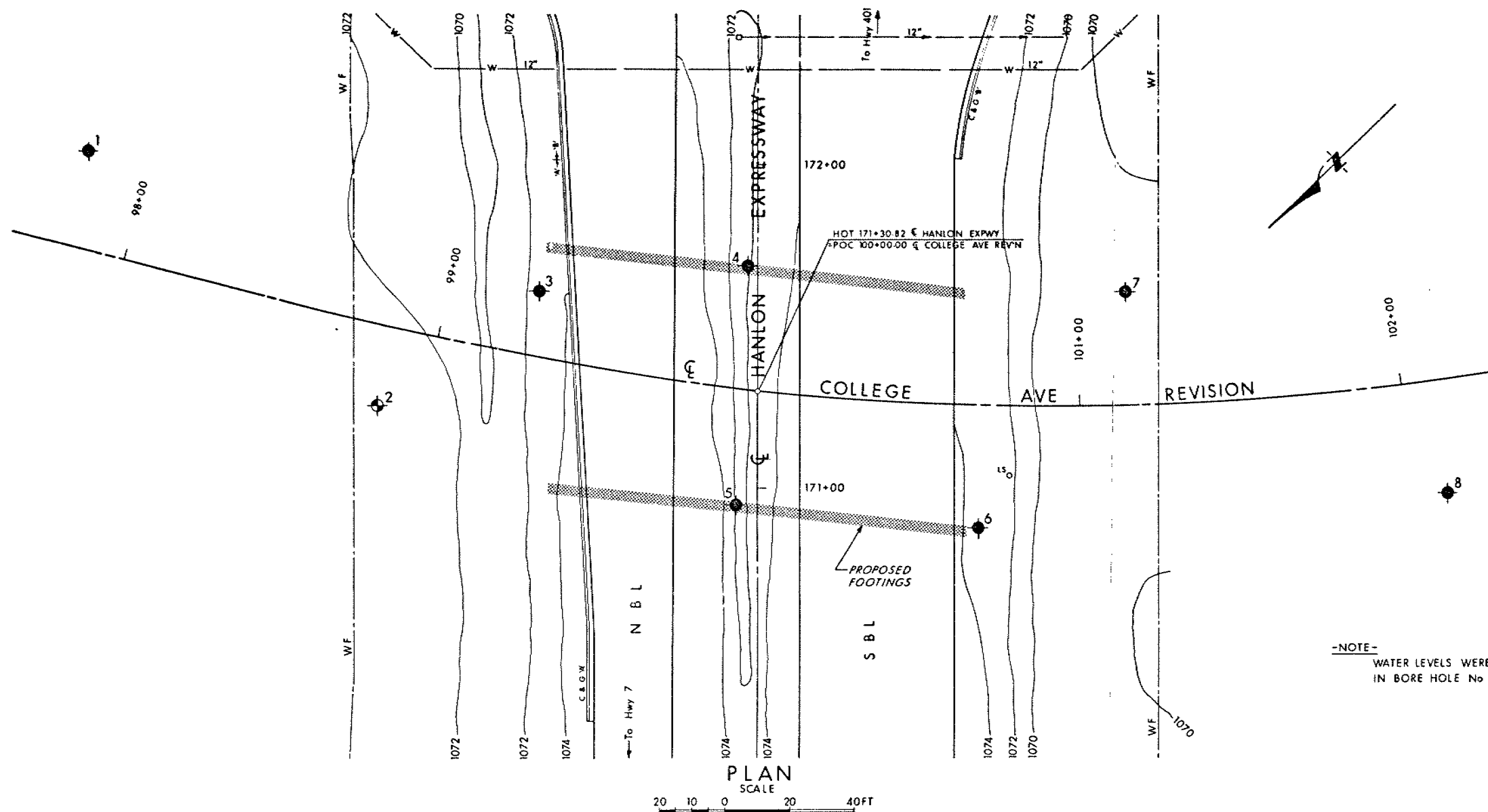
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

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

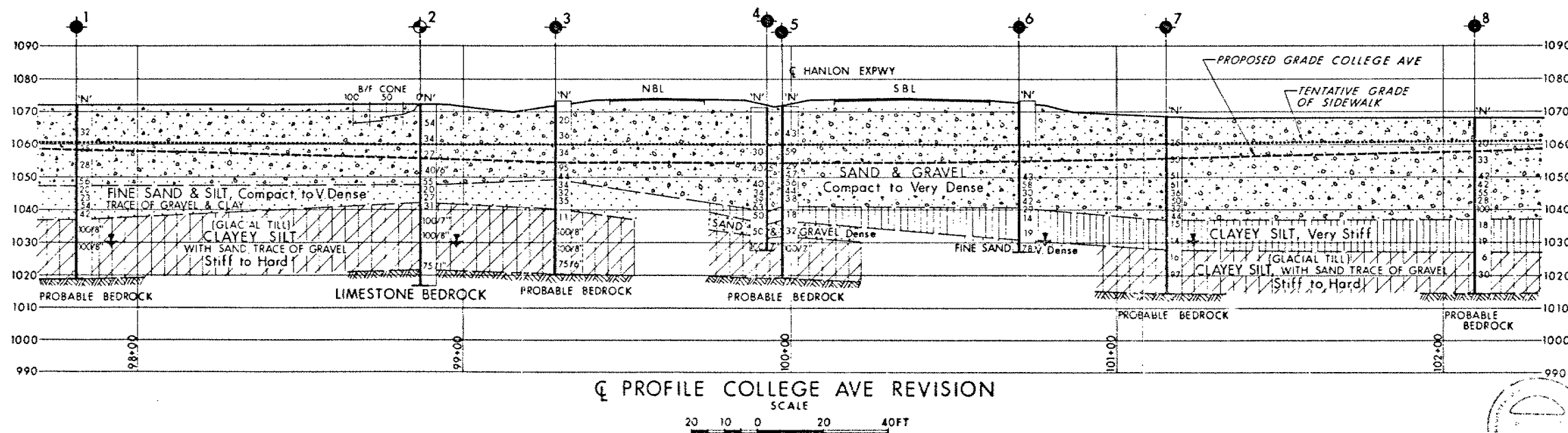
SLOPES

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



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, Nov & Dec '75		
NO.	ELEVATION	STATION	OFFSET
1	1072.1	97+81	30' LT
2	1072.3	98+87	25' RT
3	1073.3	99+28	20' LT
4	1071.4	99+93	38' LT
5	1071.8	99+97	36' RT
6	1073.7	100+70	38' RT
7	1068.8	101+15	35' LT
8	1067.9	102+10	35' RT

-NOTE-
WATER LEVELS WERE NOT ESTABLISHED
IN BORE HOLE No 3, 4, 5 & 8



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

NOTE: FOR CONTRACT DOCUMENT
The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the STRATFORD District Office.

DATE	BY	DESCRIPTION

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

COLLEGE AVE REVISION

HIGHWAY NO. HANLON EXPWY DIST NO. 3
CO. WELLINGTON City of GUELPH
TWP. 10' CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBMITTALS	CHECKED	W.P. NO. 98-75-02	DRAWING NO.
DRAWN	CHECKED	W.P. NO.	987502-A
DATE Jan 16, 1976	ST. NO. 35-420	BRIDGE DRAWING NO.	
APPROVED	CONT. NO.		

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 40P9-20

DIST. 3 REGION

W.P. No. 98-75-02

CONT. No.

W. O. No.

STR. SITE No. 35-420

HWY. No. HANLON EXPRESSWAY

LOCATION COLLEGE AVENUE

OVERPASS

No of PAGES -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

G.I-30 SEPT. 1976

CONT No
WP No. 98-75-03

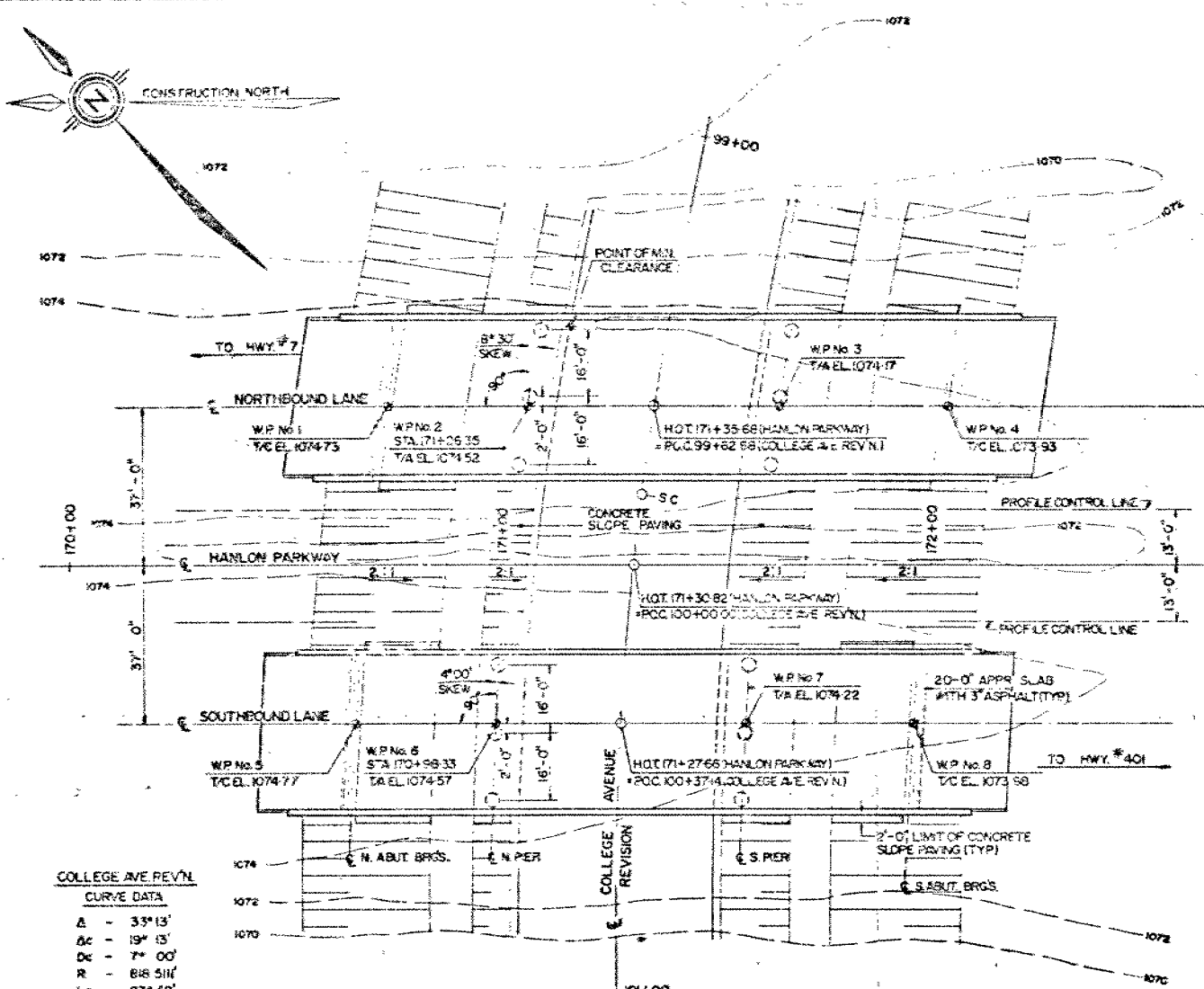
COLLEGE AVE OVERPASS (S.B.L.)
GENERAL ARRANGEMENT

SHEET

total shims hubical associates limited



CONSULTANTS



COLLEGE AVE REVN

CURVE DATA

A	- 33°13'
Δc	- 19°13'
Δc	- 7°00'
R	- 818.51'
Lc	- 274.52'
Ea	- 37.76'

SPIRAL DATA

Δs	- 7°00'
Ls	- 200'
Ts	- 344.70'

PLAN

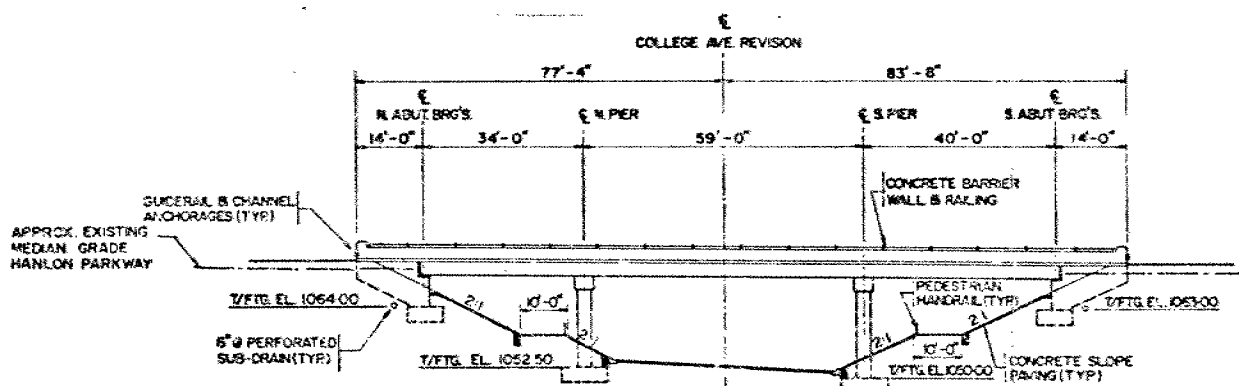
SCALE: 1" = 20'-0"

NOTES:

- W.P. DENOTES WORKING POINT.
- T/A DENOTES TOP OF ASPHALT WEARING SURFACE.
- T/C DENOTES TOP OF CONCRETE DAM.
- N.B.L. DENOTES NORTHBOUND LANE.
- S.B.L. DENOTES SOUTHBOUND LANE.

FUNCTIONS OF 4°00'(S.B.L.)

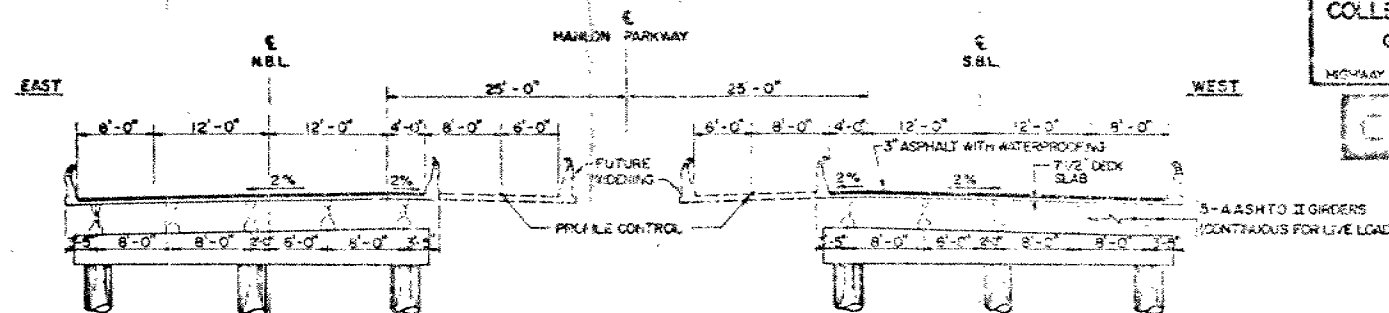
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COS.	0-99756
TAN.	0-06993
SEC.	1-00244



ELEVATION

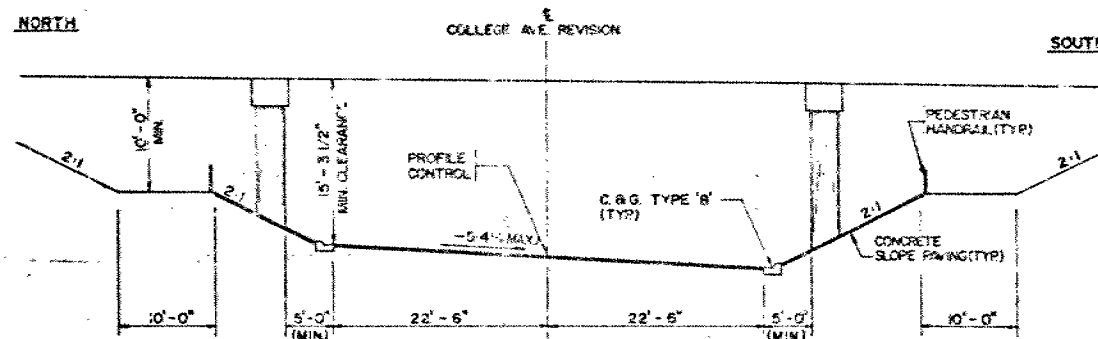
SCALE: 1" = 20'-0"

D.H.O. 5.M. 129-69 Elev. 1074.15
TABLET IN NORTH FACE OF F.H.B. JCT
COLLEGE AVE & HANLON PARKWAY 213'
LT OF STA 104+55 (COLLEGE AVE)
RESIDENCE OF J. FRAZER.



HANLON PARKWAY - TYPICAL BRIDGE SECTION

SCALE: 1" = 10'-0"



COLLEGE AVE. REVISION - TYPICAL SECTION

SCALE: 1" = 10'-0"

NOTES:

CLASS OF CONCRETE

PIERS, DECK, DIAPHRAGMS & BARRIER WALLS	4,000 PSI
PRESTRESSED GIRDERS	5,000 PSI
REMAINDER	3,600 PSI

CLEAR COVER TO REINFORCING STEEL

FOOTINGS, ABUTMENTS & WINGWALLS	3"
PIERS	2"
DECK	1" BOT, 2" TOP
APPROACH SLABS	1 1/2"
CONCRETE BARRIER WALLS	1"
GIRDERS	1"

CONSTRUCTION NOTES

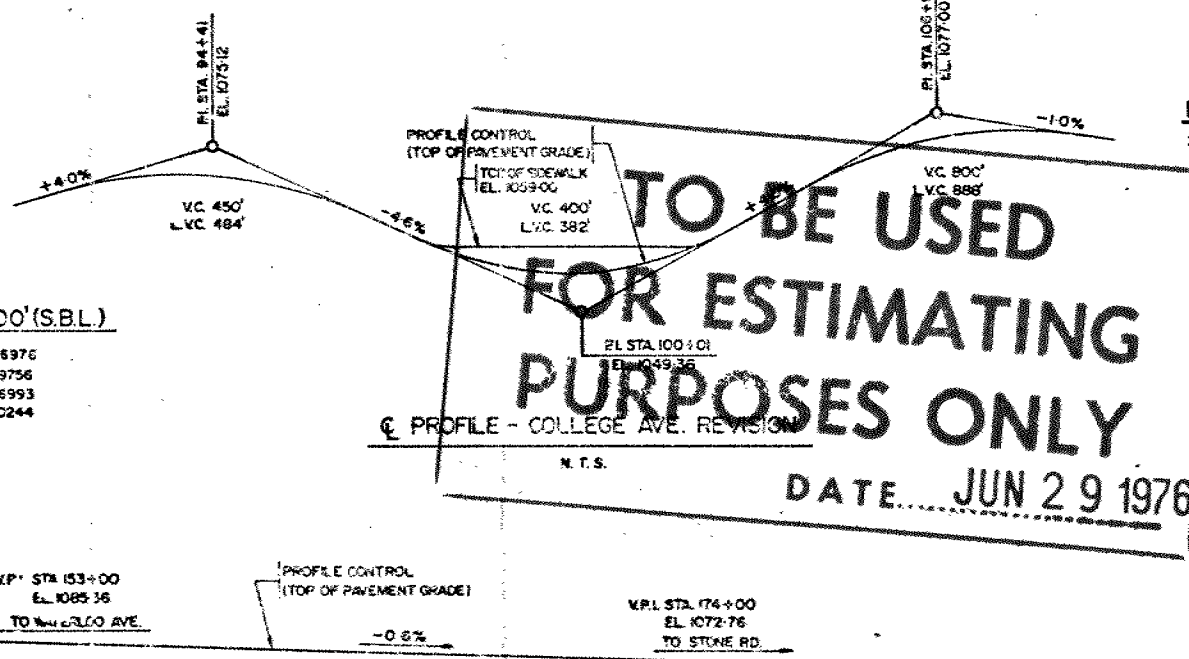
- THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF ± 1/8".
- NO CONCRETE SHALL BE PLACED AGAINST THE ADJUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.
- TO ACHIEVE THE MINIMUM CLEAR COVER OF 2" SPECIFIED, THE TOP LAYER OF REINFORCING STEEL IN THE DECK SLAB SHALL BE PLACED PRIOR TO CONCRETING WITH A CLEAR COVER OF 2" ± 1/8" TOLERANCE.
- REINFORCING STEEL SHALL BE IN ACCORDANCE WITH U.S.A. 93012 GRADE 50 EXCEPT REINFORCING STEEL IN COLUMNS SHALL BE GRADE 60.

CONCRETE QUANTITIES

CONCRETE QUANTITIES ARE LISTED BELOW FOR THE APPROPRIATE CONCRETE LUMP SUM TENDER ITEMS	
CONCRETE IN PIERS, ABUTMENTS & WINGWALLS	36 CU. YD. 3,000 PSI
CONCRETE IN DECK & DIAPHRAGMS	43 CU. YD. 4,000 PSI
CONCRETE IN BARRIER WALLS	28 CU. YD.
CONCRETE IN APPROACH SLABS	45 CU. YD.
CONCRETE IN SLOPE PAVING	45 CU. YD.

LIST OF DRAWINGS

- 35-4208-1 - GENERAL ARRANGEMENT.
- 2 - BOREHOLE LOCATIONS & SOIL STRATA.
- 3 - FOOTINGS.
- 4 - ABUTMENTS.
- 5 - WINGWALLS.
- 6 - PIERS.
- 7 - PRESTRESSED GIRDERS & BEARINGS.
- 8 - DECK DETAILS.
- 9 - CONCRETE BARRIER WALL (2'-8" HIGH).
- 10 - 20 FT. APPROACH SLAB (FOR BARRIER WALL).
- 11 - CONCRETE SLOPE PAVING.
- 12 - STEEL PARAPET RAILING (SINGLE TUBE).
- 13 - STANDARDS.
- 14 - STANDARDS.
- 15 - AS CONSTRUCTED ELEV. & DIM.

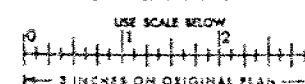


PROFILE OF HANLON PARKWAY

N.T.S.



FOR REDUCED PLAN



SCALE AS NOTED

REVISIONS	DATE	BY	DESCRIPTION

DESIGN: J.M. CHECK: J.M. (LOAD NO. 420-44) DATE: MAY 97
DRAW: J.M. CHECK: J.M. (LOAD NO. 420-44) DATE: MAY 97

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

To: A.P. Watt (2)
Regional Structural Planning Engineer
Southwestern Region, London

FROM: Soil Mechanics Section
Geotechnical Office
West Bldg.

ATTENTION:

DATE: January 16, 1976

OUR FILE REF.

IN REPLY TO

SUBJECT:

40P9-20
GEOCRES No.

FOUNDATION INVESTIGATION REPORT

For

W.P. 98-75-02
Site No. 35-420
Hanlon Expressway, Dist. 3
College Avenue Overpass
0.7 Miles South of the Speed River

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.

K. G. Selby
K.G. Selby
Supervising Engineer

KGS/bp

cc: R.S. Pillar
R.A. Dorton
B.J. Giroux
G.A. Wrong
A. Wittenberg
J.R. Roy
F.C. Brown
R. Hore
J. Anderson)
A. Crowley)
G. Sloan)
Files
Record Services

Memo only

TABLE OF CONTENTS

1. INTRODUCTION
2. SITE DESCRIPTION
3. SUBSOIL
 - 3.1 General
 - 3.2 Sand and Gravel
 - 3.3 Fine Sand to Clayey Silt
 - 3.4 Clayey Silt with Sand (Glacial Till)
 - 3.5 Limestone Bedrock
 - 3.6 Groundwater
4. DISCUSSION AND RECOMMENDATIONS
 - 4.1 General
 - 4.2 Spread Footings
 - 4.3 H-Piles
 - 4.4 Dewatering
 - 4.5 Frost Protection

FOUNDATION INVESTIGATION REPORT

For

W.P. 98-75-02

Site No. 35-420

Hanlon Expressway, Dist. 3

College Avenue Overpass

0.7 Miles South of the Speed River

1. INTRODUCTION

This report is for the design and construction of the proposed structure and its approaches at the above mentioned site. The subsoil information is based on eight sampled boreholes and the observation of a trench dug for utilities to the north of the site.

2. SITE DESCRIPTION

The proposed site is in the city of Guelph some 200 ft. north of the present intersection of College Avenue and the Hanlon Expressway.

The immediate area surrounding the site is a gently rolling granular terrace stretching between and partially burying some neighboring drumlins.

Urban development of the area is proceeding rapidly except for the North West quadrant which is owned by the Gypsum Company of Canada and contains their quarry which is situated approximately $\frac{1}{2}$ mile from the site.

3. SUBSOIL

3.1 General

The subsoil consists of 23 to 30 ft. of bedded sands and gravels laid down when the valley formed a large glacial spillway. Beneath this layer there is 5 to 10 ft. of fine grained material

ranging from fine sand to clayey silt. This layer is in turn underlain by a glacial deposit of 15 to 20 ft. of clayey silt with sand and a trace of gravel. Beneath this some 50 ft. below the surface is limestone bedrock.

3.2 Sand and Gravel

The 23 to 30 ft. of sand and gravel in this layer was laid down in beds by a much larger river which occupied the valley of the Speed in the immediate post glacial period. The deposit is well graded (Fig. 1) with Standard Penetration 'N' values ranging from 20 to in excess of 50, indicating a relative density ranging from compact to very dense. The moisture content is very low being less than 5 per cent.

3.3 Fine Sand to Clayey Silt

This layer which varies from 5 to 10 ft. in thickness consists of fine grained material. The western portion of the deposit shows a low degree of cohesiveness and a very stiff consistency. The eastern portion is generally non-cohesive consisting of up to 70% fine sand with most of the remainder being silt. The relative density of this portion of the deposit ranges from compact to dense with Standard Penetration 'N' values ranging from 20 to 54.

3.4 Clayey Silt with Sand (Glacial Till)

This deposit which is 15 to 20 ft. in thickness exhibits a low degree of plasticity. It contains large quantities of sand ranging up to 50% as well as a trace of gravel (typical grain size curves shown in Fig. 2). Consistency is generally very hard with Standard Penetration 'N' values being in excess of 100 blows per ft. The exception to this is in a shallow upper zone of the deposit which has been softened by groundwater. Moisture content for the lower portion of the deposit is generally less than 10%.

3.5 Limestone Bedrock

Limestone bedrock was encountered at a depth of approximately 50 ft. It has a relatively flat surface with only a shallow weathered zone at the surface.

3.6 Groundwater

Groundwater was encountered at approximate elevation 1030.

4. DISCUSSION AND RECOMMENDATIONS

4.1 General

It is proposed to replace the present at grade intersection of College Avenue and the Hanlon Expressway with an overpass in which the grade of College Avenue is depressed to pass under the Hanlon Expressway. This will necessitate the construction of a structure with a single 75 ft. span to carry the Hanlon Expressway over College Avenue. Retaining walls parallel to College Avenue will also be required to support sidewalks at a higher grade than that of the road.

4.2 Spread Footings

It is recommended that the structure and retaining walls be supported on spread footings. If these footings are founded at or above elevation 1050 a design load of 3 tons per sq. ft. should be employed. For computation of sliding resistance a friction coefficient of 0.5 may be assumed to apply between the base of the footing and the underlying subsoil. Total settlement, which will take place as the load is applied should not exceed 1 inch.

The coefficient of active earth pressure (k_a) for the design of the abutments can be taken as 0.33. The retaining walls on either side of the structure with a cut slope behind them should be designed using a k value of 0.4.

4.3 H-Piles

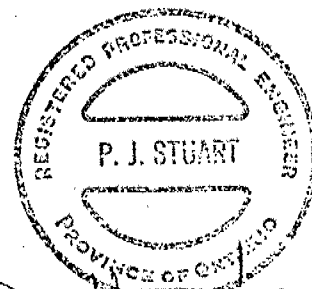
As an alternative the footings may be supported on steel H-Piles driven to bedrock at approximate elevation 1015. In this case the piles may be loaded to the allowable structural capacity of the particular section chosen.

4.4 Dewatering

No dewatering problems are anticipated as the footings will be above the present groundwater level which is at 1030.

4.5 Frost Protection

All pile caps or spread footings should be protected against frost action by a minimum 4 ft. of cover.



A handwritten signature in black ink, appearing to read "Peter Stuart", written over the bottom portion of the professional seal.

Peter Stuart
Project Engineer

A handwritten signature in black ink, appearing to read "K.G. Selby", written below the signature of Peter Stuart.

K.G. Selby
Supervising Engineer

APPENDIX

ORIGINATED BY PJS
COMPILED BY PJS
CHECKED BY _____

[illegible]

RECORD OF BOREHOLE NO 2

WP 98-75-02
DIST 3 HWY 6N
DATUM Geodetic

LOCATION Sta. 98+87 o/s 25' Rt. College Ave. Revision
BORING DATE November 26, 1975
BOREHOLE TYPE Hollow Stem Auger

ORIGINATED BY PJS
COMPILED BY PJS
CHECKED BY *CP*

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

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

20

RECORD OF BOREHOLE NO 4

WP 98-75-02

LOCATION Sta. 99+93 o/s 38' Lt. & College Ave. Revision

ORIGINATED BY PJS

DIST 3 HWY 6N

BORING DATE December 1, 1975

COMPILED BY PJS

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100					w_p ——— w ——— w_L				
							SHEAR STRENGTH									
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					WATER CONTENT % 10 20 30				
1071.4	Ground Level															
0.0	Sand and Gravel					1070										
	Compact to Very Dense		1	SS	30	1060						o			9 86 (5)	
			2	SS	40/5"		bouncing									
			3	SS	40	1050										
			4	SS	34											
			5	SS	39											
1039.4			6	SS	63	1040						o			37 57 (6)	
32.0	Clayey silt		7	SS	50											
1035.4	Very Stiff															
36.0	Sand and gravel		8	SS	50											
1031.4	Dense															
40.0	Clayey silt with sand					1030										
1027.9	traces of gravel (Glacial Till) Hard		9	SS	100/7"							o				
43.5	End of Borehole Note: Water Level not established.															

RECORD OF BOREHOLE NO 5

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

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

RECORD OF BOREHOLE NO 6

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

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_P	W	W_L		
1073.7	Ground Level															
0.0	Sand and Gravel					1070										
	Compact to Very Dense		1	SS	12	1060										
			2	SS	27											31 66 (3)
			3	SS	43	1050										
			4	SS	58											
			5	SS	30											36 59 (5)
			6	SS	42											
1040.7			7	SS	29	1040										
33.0	Clayey silt		8	SS	14											
	Very Stiff		9	SS	19											
1030.7						1030										
43.0	Fine sand															
1027.2	Very Dense		10	SS	78											
46.5	End of Borehole															

RECORD OF BOREHOLE NO 7

WP 98-75-02 LOCATION Sta. 101+15 o/s 35' Lt. 2 College Ave. Revision ORIGINATED BY PJS
 DIST 3 HWY 6N BORING DATE December 3, 1975 COMPILED BY PJS
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger CHECKED BY [Signature]

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

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 8

WP 98-75-02

LOCATION Sta. 102+10 o/s 35' Rt. 6 College Ave. Revision

ORIGINATED BY PJS

DIST 3 HWY 6N

BORING DATE December 3, 1975

COMPILED BY PJS

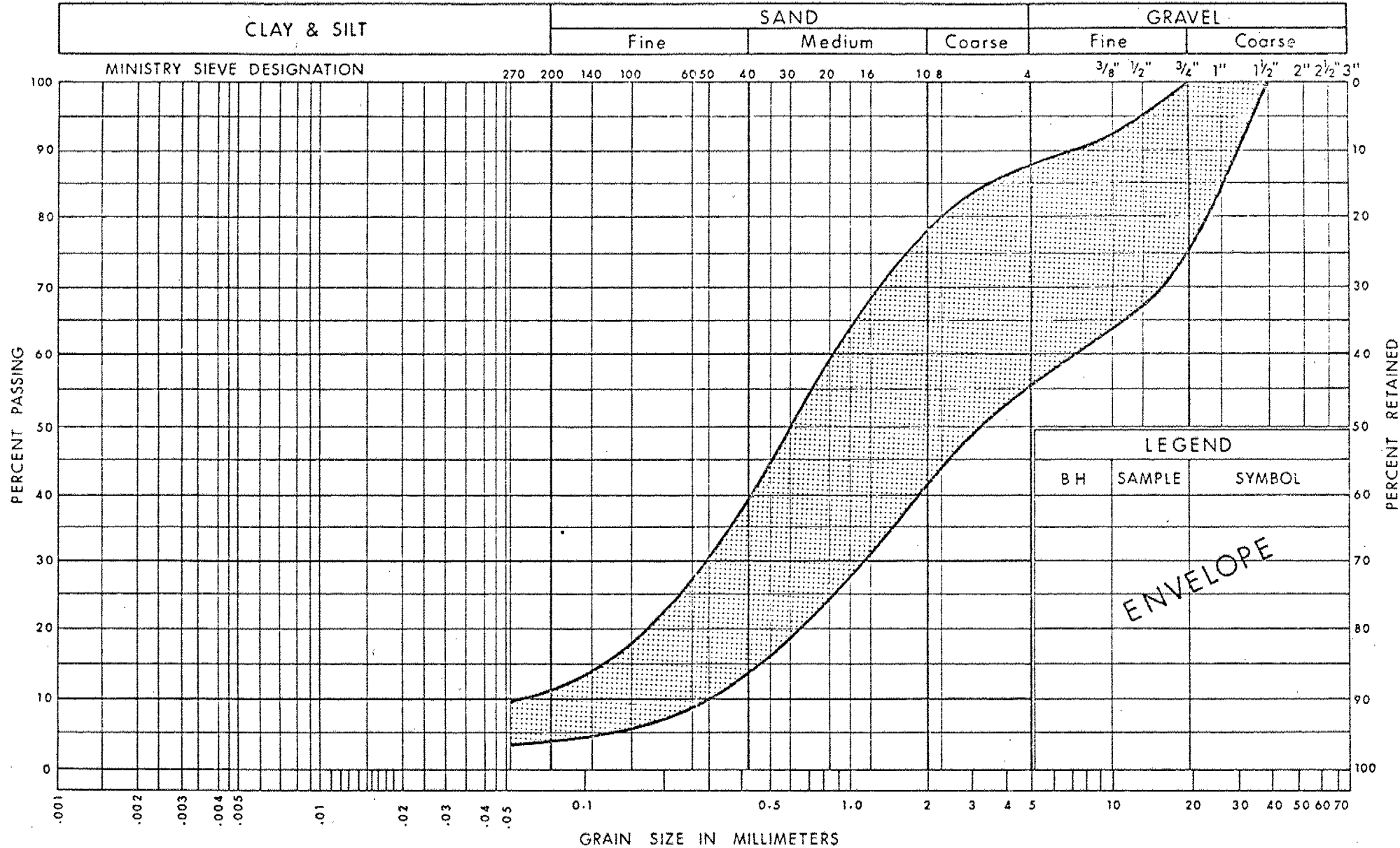
DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY ep.

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

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation and
Communications

Ontario

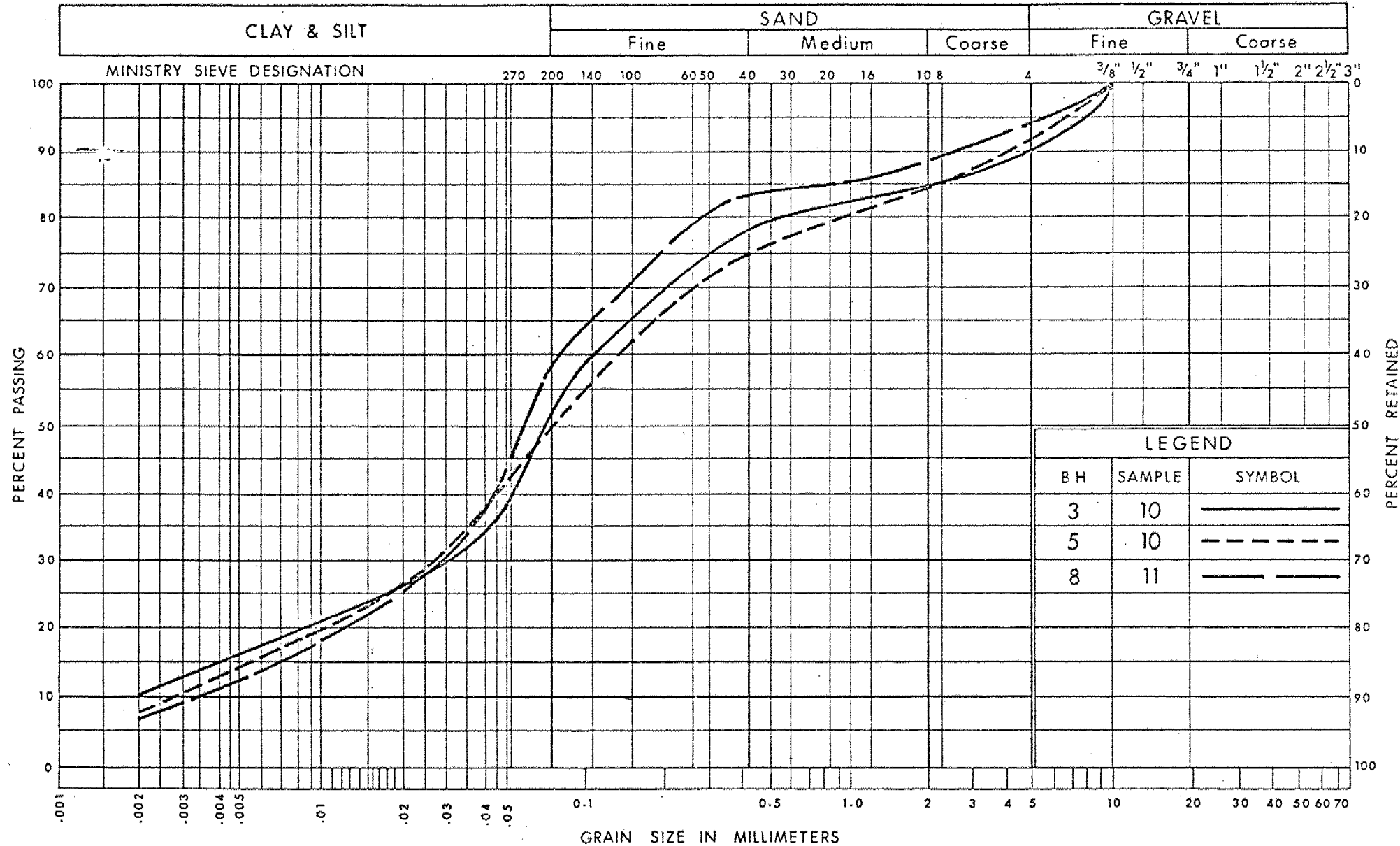
ENGINEERING SERVICES BRANCH

GRAIN SIZE DISTRIBUTION
SAND & GRAVEL

FIG No 1

WP 98-75-02

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation and
Communications
Ontario
ENGINEERING SERVICES BRANCH

GRAIN SIZE DISTRIBUTION
CLAYEY SILT (GLACIAL TILL)
WITH SAND, TRACE OF GRAVEL

FIG No 2
WP 98-75-02

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 :-

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

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 "		

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
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_i	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

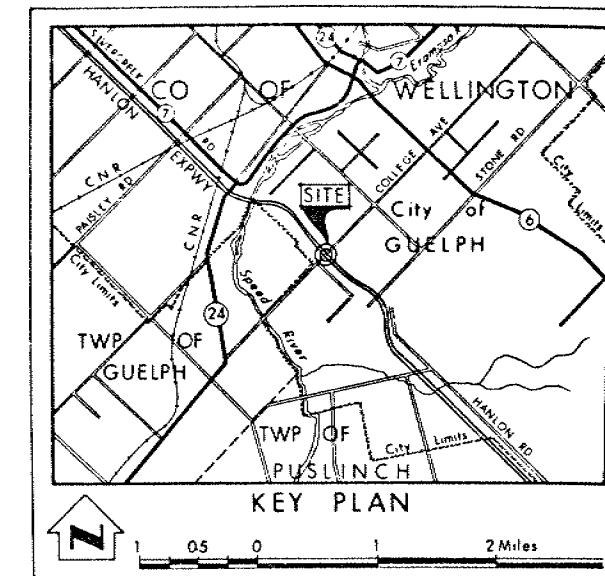
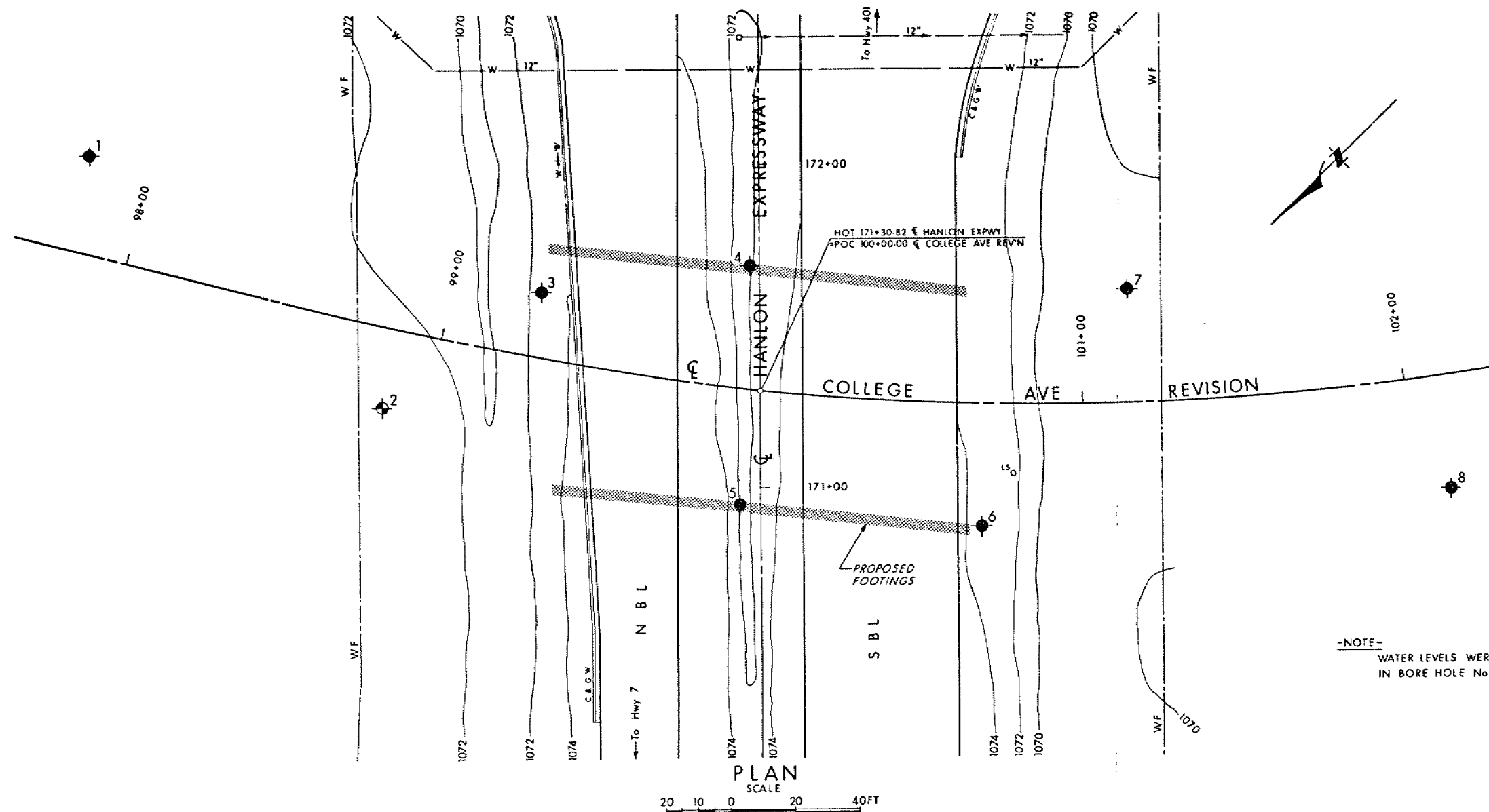
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

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

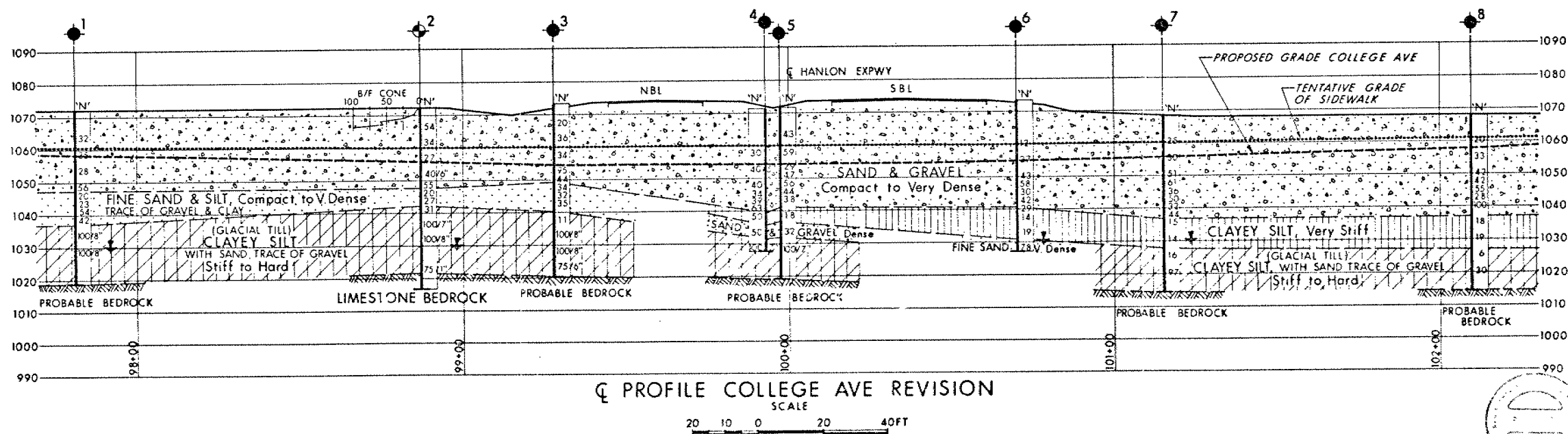
SLOPES

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



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, Nov & Dec '75		
NO.	ELEVATION	STATION	OFFSET
1	1072.1	97+81	30' LT
2	1072.3	98+87	25' RT
3	1073.3	99+28	20' LT
4	1071.4	99+93	38' LT
5	1071.8	99+97	36' RT
6	1073.7	100+70	38' RT
7	1068.8	101+15	35' LT
8	1067.9	102+10	35' RT

-NOTE-
WATER LEVELS WERE NOT ESTABLISHED
IN BORE HOLE No 3, 4, 5 & 8



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

NOTE: FOR CONTRACT DOCUMENT
The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the STRATFORD District Office.

REVISIONS	DATE	BY	DESCRIPTION

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

COLLEGE AVE REVISION

HIGHWAY NO HANLON EXPWY DIST NO 3
CO WELLINGTON City of GUELPH
TWP LOT CON

BORE HOLE LOCATIONS & SOIL STRATA

SUBMPTS CHECKED	WP NO 98-75-02	DRAWING NO
DRAWN <u> </u> CHECKED <u> </u>	NO NO	987502-A
DATE Jan 16, 1976	SITE NO 35-420	BRIDGE DRAWING NO
APPROVED	CONT NO	

REF No E-5395-1, Nov 1975