Department of Transportation and Communications

MEMORANDUM

TO:	Mr. A. P. Watt, (2) Regional Bridge Planning Engineer, Southwestern Region, London, Ontario.	FROM:	Foundations Office, Design Services Branch, Central Bldg., Downsview.
ATTENTION:		DATE:	November 29, 1971.
OUR FILE REF.		IN REPLY TO	DEC 2 1971

SUBJECT:

40I15-18
GEOCRES No.

FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at
Penn Central Railway and Hwy. 19
City of Tillsonburg - Co. of Oxford
District No. 2 (London)
W.O. 71-11098 - W.P. 184-63-02

Attached, we are forwarding to you our detailed foundation investigation report on the subsoil conditions existing at the above structure 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 FOUNDATION ENGINEER.

AGS/ao
Attach.
cc: Messrs. D. W. Farren
B. R. Davis
A. Rutka
W. A. Zonnenberg
L. E. Walker
B. J. Giroux
J. R. Roy
G. A. Wrong
B. A. Singh

Foundations Files
Documents

TABLE OF CONTENTS

- - - - - - - - - - - - -

FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing At
Penn Central Railway and Hwy. 19
City of Tillsonburg - Co. of Oxford
District No. 2 (London)
W.O. 71-11098 W.P. 184-63-02

1. INTRODUCTION:

A request for a foundation investigation at the crossing of the Penn Central Railway and Hwy. 19 was received from Mr. A. P. Watts, Regional Bridge Planning Engineer, in a memo dated September 1, 1971.

A field investigation was subsequently carried out by the Foundation Section to determine the subsoil conditions existing at the site. This report contains the results of this investigation and our recommendations pertaining to the design of the proposed structure foundations and approaches.

2. DESCRIPTION OF SITE:

The site of the proposed crossing is located near the north city limit of Tillsonburg.

The area in the immediate vicinity is flat, and about 6 ft. lower than the elevations of the tracks. The area is surrounded on the north and south sides by small industrial buildings, about 200 ft. away from the proposed crossing.

Physiographically, the site is located in the region referred to as the Norfolk Sand Plain.

..... 2

3. FIELD AND LABORATORY INVESTIGATION PROCEDURES:

A total of two sampled boreholes and four dynamic cone penetration tests was carried out during the course of the field work. Boring was achieved by means of a C.M.E. hollow stem auger machine, adapted for soil sampling and diamond drilling purposes. During the field work, disturbed samples were obtained by means of a standard split-spoon sampler; the energy used in driving it, conformed to the requirements of the Standard Penetration Test.

Dynamic cone penetration tests were carried out adjacent to each borehole, and at two other locations. Driving energy used to advance the cone was 350 ft.-lbs. per blow.

All boreholes were surveyed in the field by personnel from London Region Engineering Survey Section. The locations and elevations of the borings are shown on Drawing No. 71-11098A, which accompanies this report.

All samples were visually examined and classified at the site as well as in the laboratory. Following this inspection, laboratory tests were carried out on selected samples to determine the following physical properties:

Atterberg Limits.

Moisture Content.

Grain-Size Distribution.

The results of the field and laboratory tests are summarized on the Record of Borehole sheets contained in the Appendix to the report.

..... 3

4. SUBSOIL CONDITIONS:

4.1) General:

Generally, uniform subsoil conditions were found to prevail over the area investigated. The subsoil consists of sand and gravel fill, followed by a deep deposit of sandy silt to silty sand, followed by a layer of clayey silt to silt, which in turn overlies a layer of sandy silt.

The boundaries between various soil types are shown on the Record of Borehole Sheets. The estimated stratigraphical profile shown on Drawing No. 71-11098A is based upon this information.

A detailed description of soil types and soil properties is given, as follows:

4.2) Fill, Sand and Gravel:

This material was found from ground surface downward to depths of 4.0 ft. (Borehole 1) to 5.0 ft. (Borehole 2). The material was placed to elevate the tracks above the surrounding ground surface, and consists of sand and gravel. The 'N' values of 7 to 16 blows/ft. indicate a loose to compact relative density.

4.3) Sandy Silt to Silty Sand, Traces of Gravel and Clay:

This was the predominant soil deposit and was found in both boreholes. Its thickness in Borehole 1 was 56 ft. and in Borehole 2 was 59 ft. All four cone penetration tests were terminated in this depcsit.

..... 4

The material consists of sandy silt to silty sand with traces of gravel and clay. The grain size analyses indicate the following ranges of distribution, and are plotted on Fig. 2.

Gravel	0 - 2 %
Sand	6 - 91 %
Silt and Clay	9 - 92 %

The relative density, as indicated by Standard Penetration Tests, varies from loose to very dense. The material is very pervious and highly susceptible to 'boiling' under an unbalanced hydrostatic head.

4.4) Clayey Silt to Silt, Traces of Sand and Gravel:

This material was found underlying the sandy silt to silty sand deposit. The thickness of this layer was 15.0 ft. (Borehole 1) to 16.0 ft. (Borehole 2).

The material consists of clayey silt to silt, with traces of sand and gravel. Physical properties of the material, as determined from laboratory tests are as follows: (See Fig. 1)

Liquid Limit	21 - 34 %
Plastic Limit	12 - 18 %
Natural Moisture Content	14 - 28 %

Grain-size analyses performed on the same material indicate the following distributions: (Fig. 3)

Gravel	0 - 1 %
Sand	0 - 12 %
Silt	51 - 67 %
Clay	24 - 49 %

..... 5

The Standard Penetration Tests gave 'N' values ranging from 15 to 30 blows/ft., indicating a very stiff to hard consistency.

4.5) Sandy Silt, Some Gravel And Clay:

This stratum was encountered at depths of 75.0 ft. (Borehole 1) and 82.0 ft. (Borehole 2) down to depths of 86.0 ft. (Borehole 1) and 95.0 ft. (Borehole 2). Refusal to further augering and to further penetration by split-spoon was reached at these depths. The refusal indicated the probable bedrock or boulders.

Only two samples were recovered from this stratum. The grain-size analyses indicated the following distributions: (Fig. 3)

		BH #1	BH #2
Gravel	%	20	7
Sand	%	24	12
Silt	%	45	64
Clay	%	11	17

The 'N' values of 40 and 131 blows/ft. indicate a dense to very dense relative density.

5. GROUNDWATER CONDITIONS:

The following water levels were observed in the boreholes at the time of investigation:

Borehole 1	Depth 12.0 ft.	Elev. 788.5 ft.
Borehole 2	Depth 12.2 ft.	Elev. 788.7 ft.

..... 6

6. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct a subway under the Penn Central Railway tracks. The proposed grade of the highway under the tracks is at elevation 784.0. In order to provide the necessary clearance the tracks will be raised 2.7 ft. above the present level. Thus a cut some 16 ft. deep will be required.

The proposed grade of the highway is 5 ft. below the prevailing ground water level. The material under the present highway is highly pervious. Therefore, the proposed scheme will require a permanent dewatering scheme to lower the ground water level below the future pavement. Sub-drains, some 5 ft. deep below finished ground level, should be constructed at the toe of slopes for this purpose. In addition, it may be necessary to provide a filter blanket (12 inches thick) on the lower portion of the slopes in order to prevent piping of soil from the slopes. This latter requirement can best be decided upon at the time of construction.

Subsoil material is quite competent to provide adequate bearing capacity for spread footing type foundations which can be placed 5 ft. below the finished grade. A net allowable bearing pressure of 2 TSF may be assumed for design purposes. However, the material to be excavated is highly susceptible to 'boiling' under an unbalanced hydrostatic head. Therefore, a temporary dewatering scheme will be required to lower the water level to below the base of the excavation during construction.

..... 7

Because of the above-mentioned dewatering problems, it appears that an overhead structure would be more suitable from the foundation point of view. If the latter proposal is accepted, then the structure may be supported on spread footing type foundations placed at elevation 790.0 ft. This will obviate the necessity for any dewatering scheme, temporary or permanent.

Irrespective of which scheme is accepted (overhead or subway), the entire structure may be supported on steel H piles. It is estimated that practical refusal will be met at approximate elevation 710±5 ft. Maximum allowable loads for the particular section adopted may be used for design purposes.

No stability problems are anticipated for 2:1 side slopes either cut or fill.

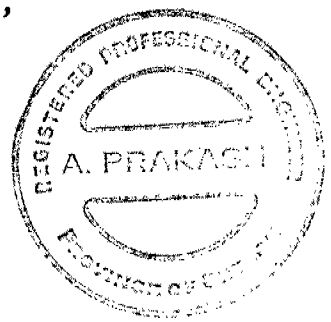
Because of the granular nature of the underlying subsoil any heave or settlement will occur immediately.

7. MISCELLANEOUS:

The field investigation was carried out during the period of October 8 - 15, 1971, under the supervision of Mr. A. Prakash, Project Foundation Engineer, who also prepared this report.

Equipment was owned and operated by P.V.K. and Sons Ltd.

This report was reviewed by Mr. K. G. Selby, Supervising Foundation Engineer.



A Prakash

A. Prakash, P. Eng.

K. G. Selby

K. G. Selby, P. Eng.

AP/afm
November 26/71

A P P E N D I X I

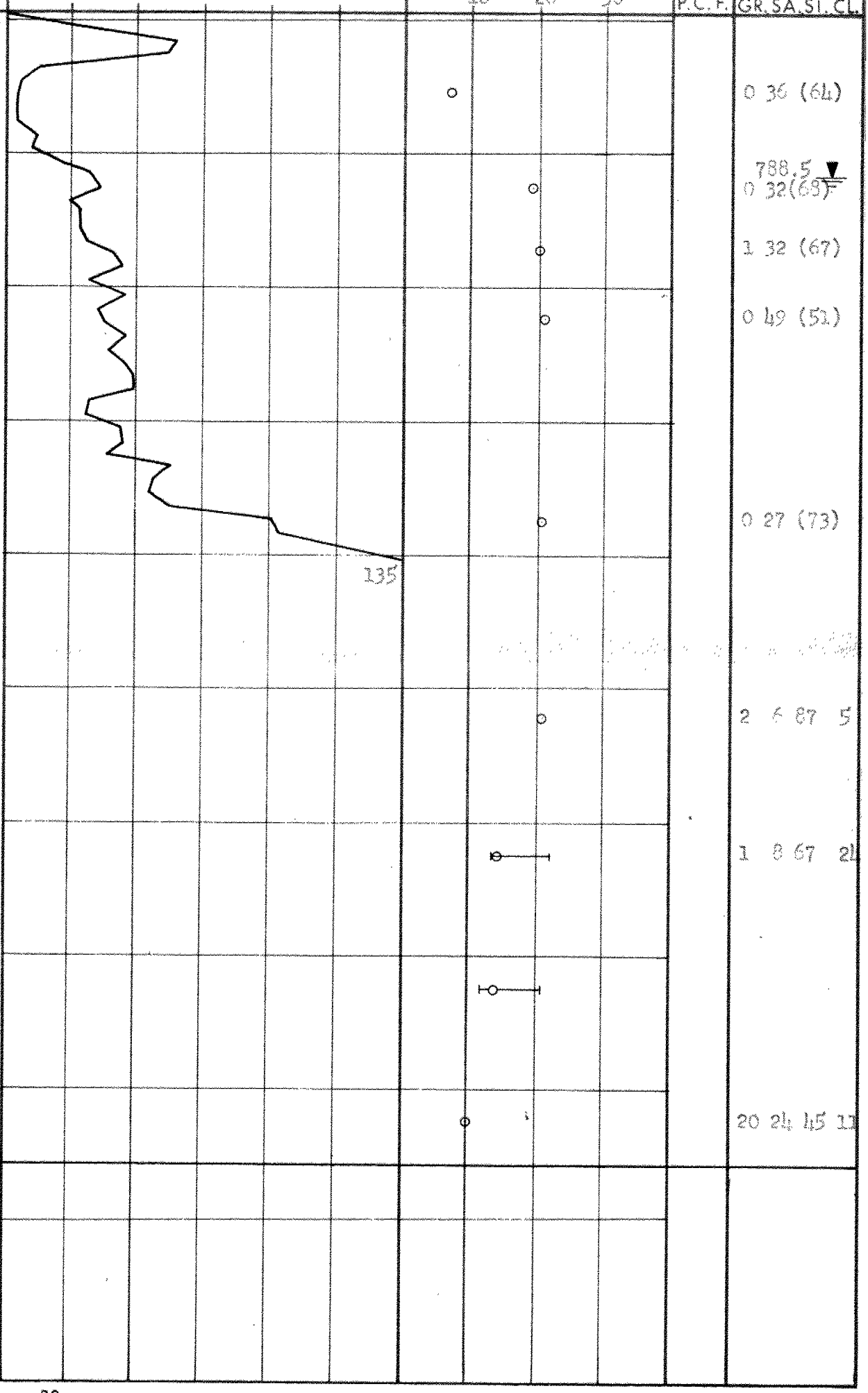
DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 71-11098 LOCATION Sta. 77 + 04 o/s 45' Rt. ORIGINATED BY AP
W.P. 184-63-02 BORING DATE October 8, 12 & 13, 1971 COMPILED BY FP
DATUM Geodetic BOREHOLE TYPE C.M.E. CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
800.5	Ground Level				
0.0	Fill				
796.5	Sand and gravel, Compact		1	SS	16
4.0			2	SS	7
			3	SS	12
			4	SS	20
	Sandy silt to silty sand, traces of gravel and clay.		5	SS	22
			6	SS	28
			7	SS	28
			8	SS	9
			9	SS	30
			10	SS	28
	Loose to Compact		11	SS	30
	Very Dense		12	SS	57
	Compact		13	SS	11
	Dense to Very Dense		14	SS	85
			15	SS	46
740.5					
60.0	Clayey silt to silt, traces of sand and gravel.		16	SS	38
	Very Stiff to Hard		17	SS	26
725.5					
75.0	Sandy silt, some gravel and clay.				
	Very Dense		18	SS	131
714.5					
86.0	Refusal End of Borehole Probable Bedrock or Boulders				



BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
	0 36 (64)
	788.5 ▼ 0 32 (68)
	1 32 (67)
	0 49 (51)
	0 27 (73)
	2 6 67 5
	1 8 67 24
	20 24 45 11

20
15 ⊕ 5 % STRAIN AT FAILURE
10

FORM OD-M[illegible] 126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 71-11098 LOCATION Sta. 77 + 88 o/s 35' Lt. ORIGINATED BY AP
W.P. 184-63-02 BORING DATE October 13 & 14, 1971 COMPILED BY PT
DATUM Geodetic BOREHOLE TYPE C.M.E. CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
800.9	Ground Level				
0.0	Fill				
	Sand and gravel.		1	SS	7
795.9	Loose				
5.0			2	SS	7
	Loose				
			3	SS	27
	Sandy silt to silty sand traces of gravel and clay		4	SS	26
	Compact		5	SS	22
			6	SS	23
			7	SS	28
	Very Dense		8	SS	57
	Dense		9	SS	42
	Compact		10	SS	23
736.9					
64.0	Clayey silt to silt, traces of sand and gravel		11	SS	15
	Very Stiff		12	SS	30
719.9					
82.0	Sandy silt, some gravel and clay		13	SS	40
	Dense				
705.9					
95.0	Refusal End of Borehole Probable Bedrock or Boulder.				

ELEV. SCALE: 800, 790, 780, 770, 760, 750, 740, 730, 720, 710

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — 20 40 60 80 100

SHEAR STRENGTH P.S.F.
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

100/6

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w

WATER CONTENT % — 10 20 30

BULK DENSITY γ P.C.F.

REMARKS	GR.	SA.	SI.	CL.
	0	43	(57)	
783.7 ▼				
	0	27	(?)	
	2	44	(54)	
	0	71	(29)	
	0	52	41	7
	0	0	51	49
	0	12	54	34
	7	12	64	17

20
15 ⊹ 5 % STRAIN AT FAILURE
10

FORM OD–MT 126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 71-1109 LOCATION Sta. 77 + 31, 0's 50' Rt. ORIGINATED BY AP
W.P. 184-63-02 BORING DATE October 15, 1971 COMPILED BY TP
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Test CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB. VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w w_P — w — w_L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
795.0 Ground level										
0.0	Probable sandy silt to silty sand, traces of gravel and clay. Loose to Very Dense					790				
						780				
						770				
773.0						760				
12.0	End of Cone Test					750				

20
15 ⊹ 5 % STRAIN AT FAILURE
10

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 71-1102F LOCATION Sta. 77 + 17 o/s 59' Lt. ORIGINATED BY AP
W.P. 168-63-02 BORING DATE October 15, 1971 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Test CHECKED BY [illegible]

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w — WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
796.7 / 0.0	Ground Level									
	Probable sandy silt to silty sand, traces of gravel and clay. Loose to Very Dense					790				
						780				
						770				
						760				
742.7 / 54.0	End of Cone Test					750				
						740				

20
15 ◇ 5 % STRAIN AT FAILURE
10

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 :-

CONSISTENCY	'N' BLOWS / FT.	c LB. / SQ. FT.	DENSENESS	'N' BLOWS / FT.
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

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
	IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION
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

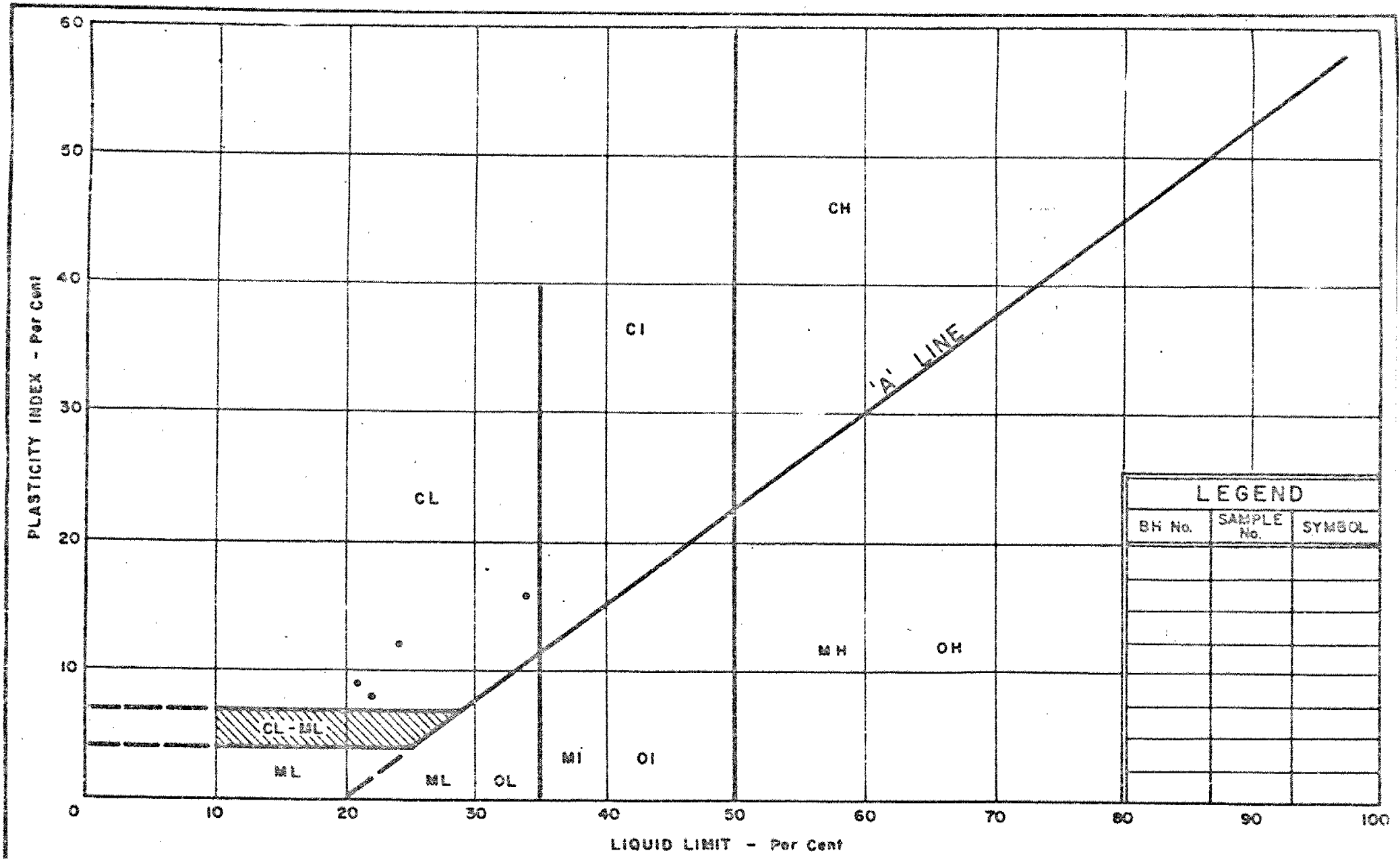
FOUNDATIONS

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

FORM OB-MT-252
REVISED JUL 1966



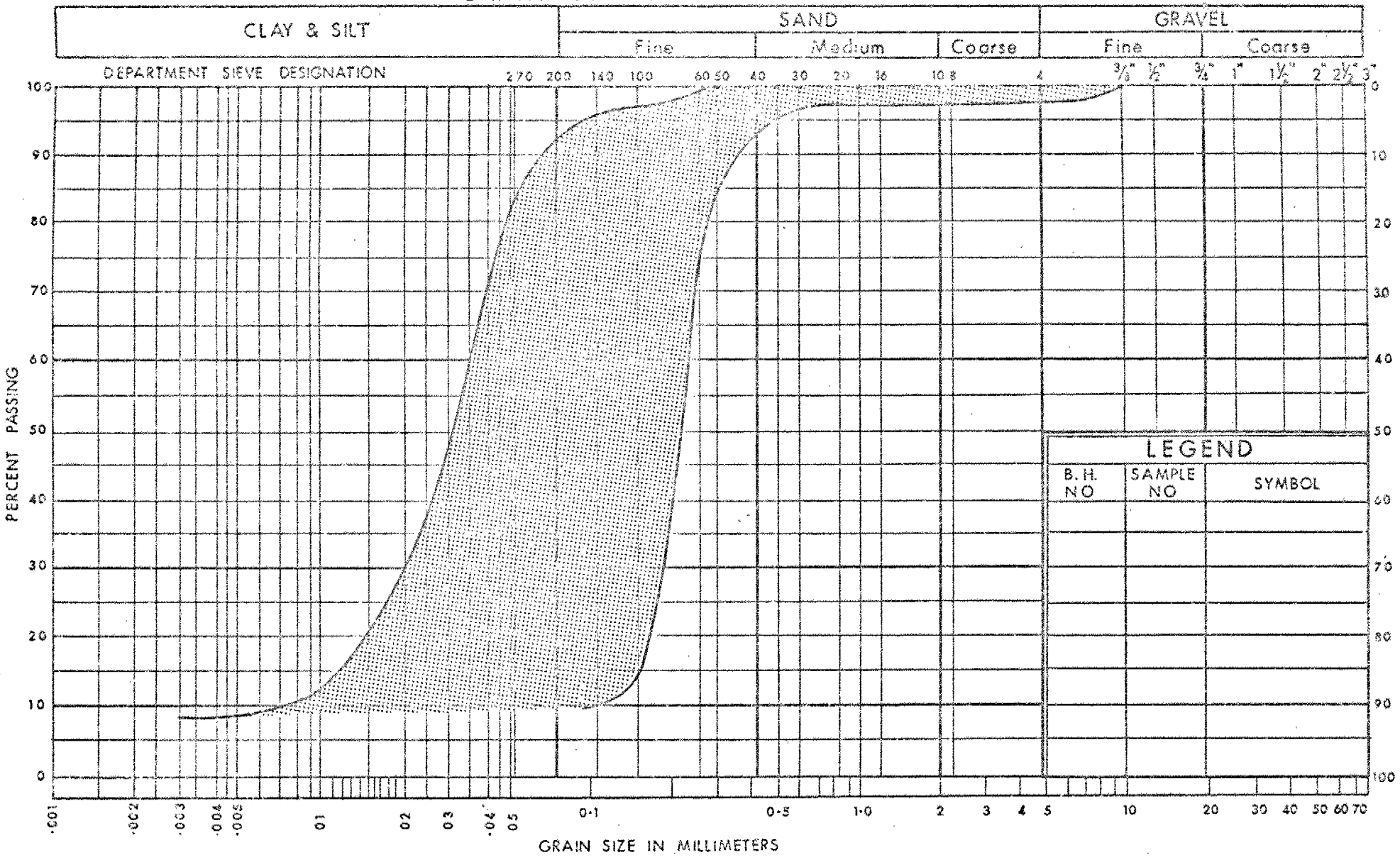
DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

PLASTICITY CHART
CLAYEY SILT TO SILT

W.P. No. 184-63-02
JOB No. 71-11098
FIG. 1

FORM OD-MT-17
REV. AUG. 1971

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO
DESIGN SERVICES BRANCH

GRAIN SIZE DISTRIBUTION

SANDY SILT TO SILTY SAND

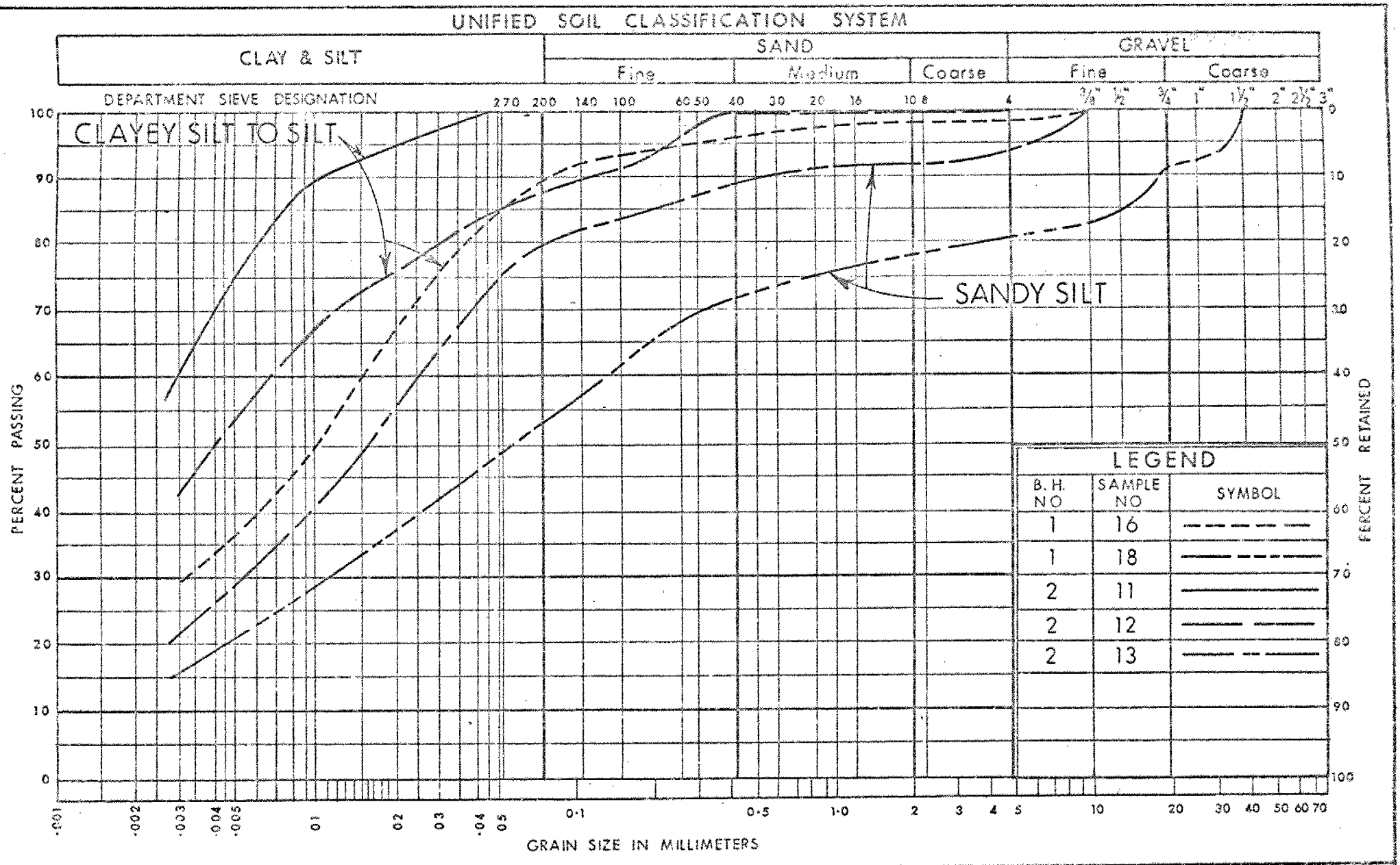
TRACES OF GRAVEL & CLAY

W.P. No. 184-63-02

JOB No. 71-11098

FIG. 2

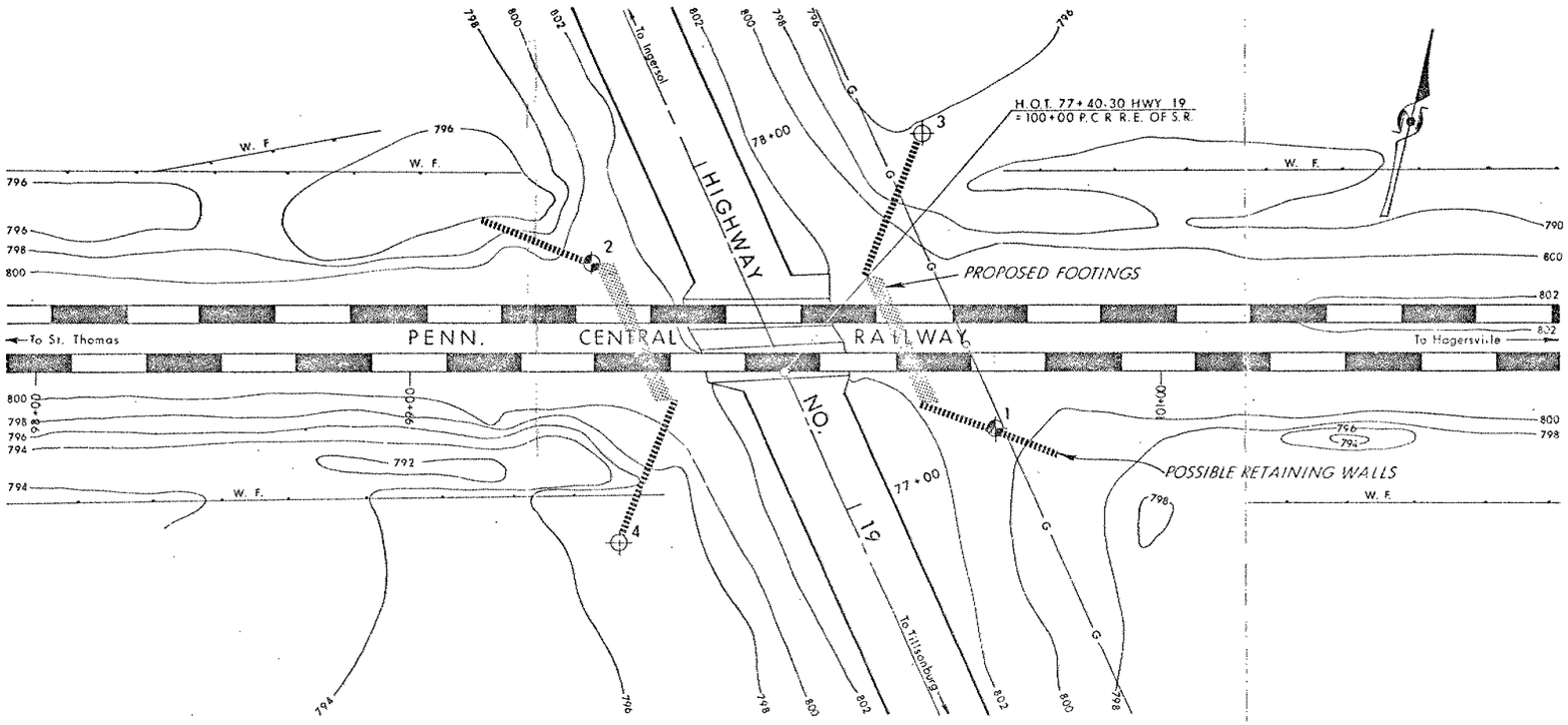
FORM OD-MT-17
REV. AUG. 1971



DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO
DESIGN SERVICES BRANCH

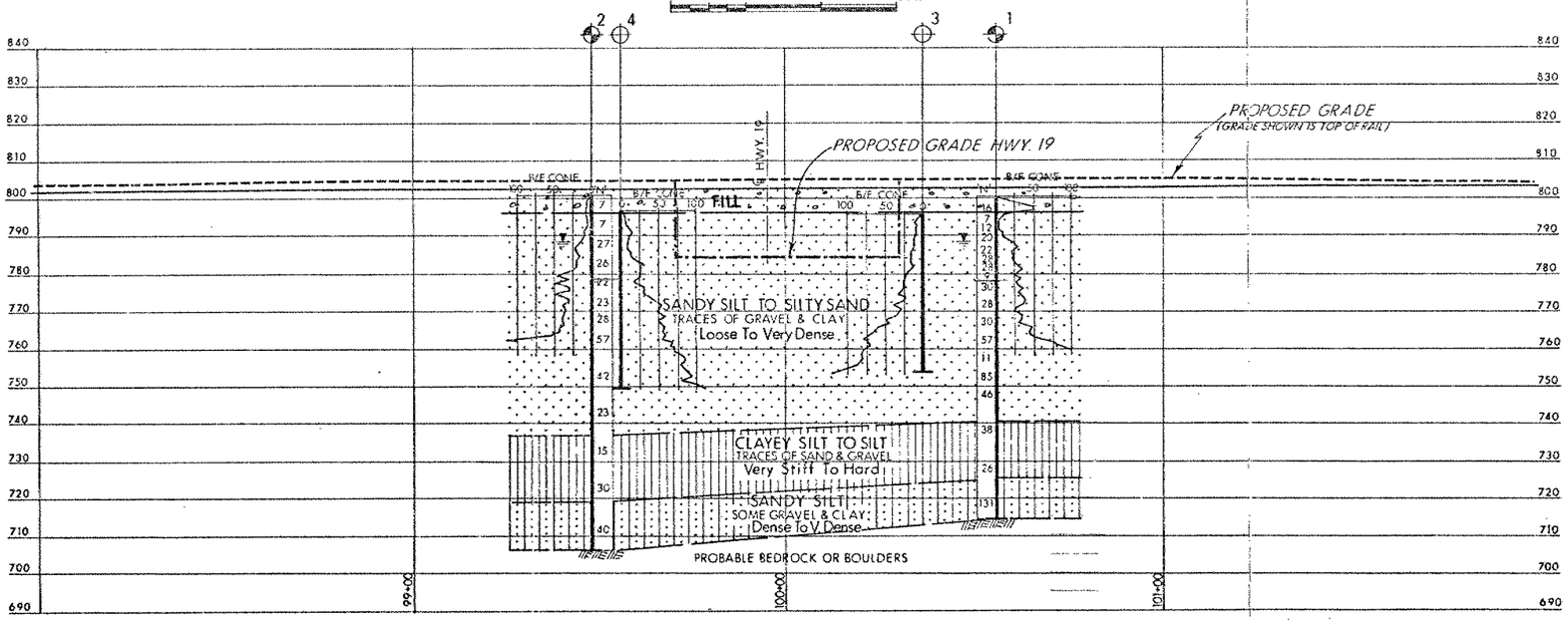
GRAIN SIZE DISTRIBUTION

W.P. No. 184-63-02
JOB No. 71-11098
FIG. 3



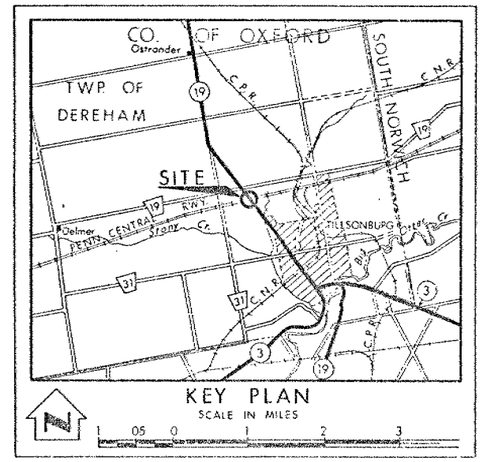
PLAN

SCALE 20 10 0 20 40FT.



PROFILE

SCALE 20 10 0 20 40FT.



KEY PLAN

SCALE IN MILES 1 .05 0 1 2 3

LEGEND

- Bore Hole
- Cone Penetration Test
- Bore Hole & Cone Test
- Water Levels established at time of field investigation. OCT., 1971

NO.	ELEVATION	STATION	OFFSET
1	800.5	77+04	45'RT.
2	800.9	77+88	35'LT.
3	795.9	77+84	59'RT.
4	796.7	77+17	59'LT.

— NOTE —

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

REVISIONS			
	DATE	BY	DESCRIPTION

DEPARTMENT OF TRANSPORTATION & COMMUNICATIONS
DESIGN SERVICES BRANCH —— FOUNDATION OFFICE

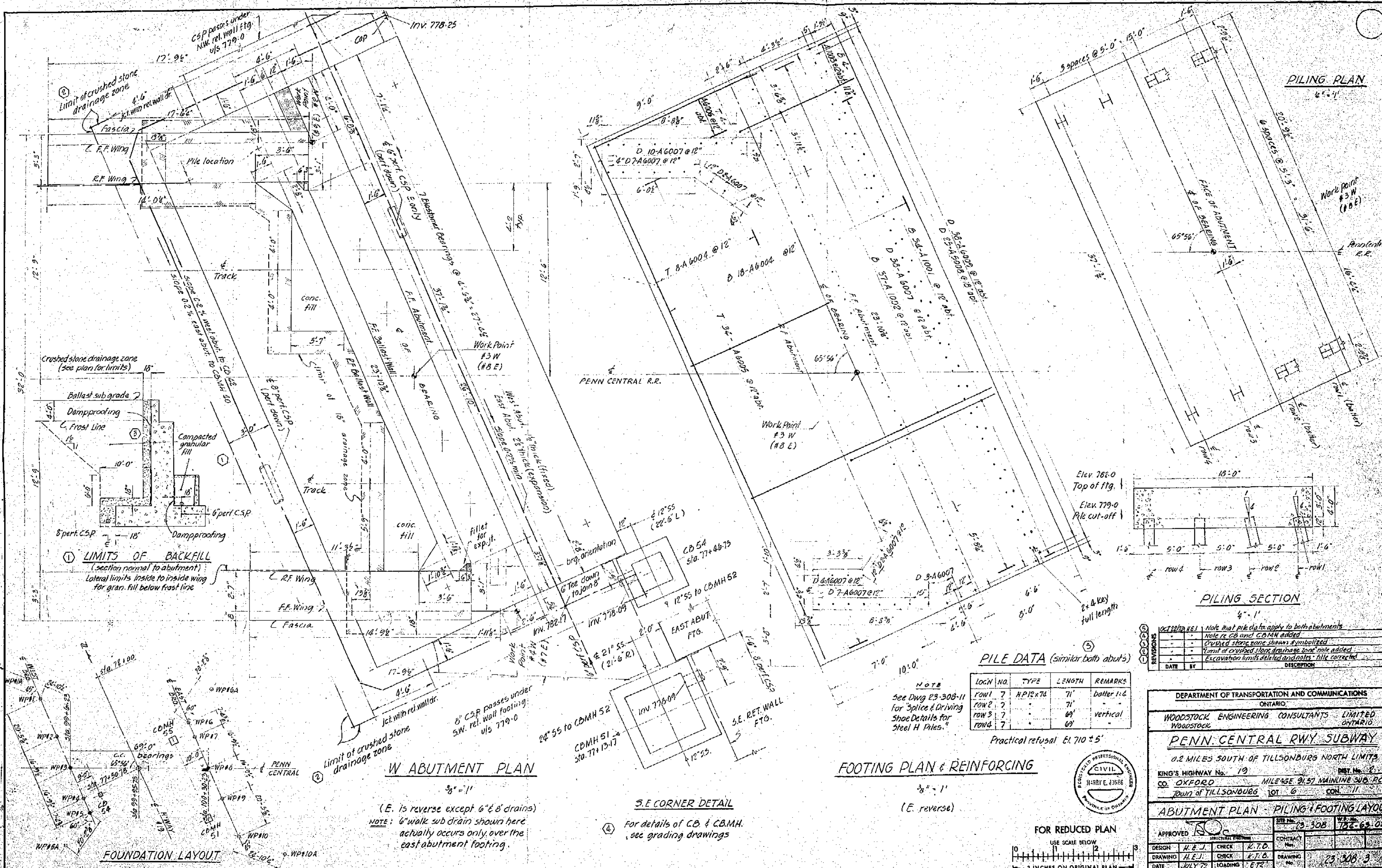
PENN. CENTRAL RAILWAY

HIGHWAY NO. 19 DIST. NO. 2
CO. OXFORD
TWP. DEREHAM LOT 6 CON. III

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD. A.P.	CHECKED	W.P. NO. 184-63-02	DRAWING NO. 71-11098A
DRAWN E.D.	CHECKED	JOB NO. 71-11098	
DATE NOV. 15, 1971		SITE NO.	BRIDGE DRAWING NO.
APPROVED (PRINCIPAL FOUNDATION ENGINEER)		CONT. NO.	

REF NO. E-5302-1



PILE DATA (similar both abuts) ⑤

LOC'N	NO.	TYPE	LENGTH	REMARKS
row 1	7	HP12x74	71'	batter 1:4
row 2	7	"	71'	" "
row 3	7	"	69'	vertical
row 4	7	"	69'	"

Practical refusal El. 710 ± 5'

REVISIONS

No.	DATE	BY	DESCRIPTION
5	OCT 22/73	HEJ	Note that pile data apply to both abutments
4	"	"	Note re CB and CBMH added
3	"	"	Crushed stone zone shown symbolized
2	"	"	"Limit of crushed stone drainage zone" note added
1	"	"	Excavation limits deleted and notes - title corrected

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO

WOODSTOCK ENGINEERING CONSULTANTS LIMITED
WOODSTOCK ONTARIO

PENN. CENTRAL RWY. SUBWAY

0.2 MILES SOUTH OF TILLSONBURG NORTH LIMITS

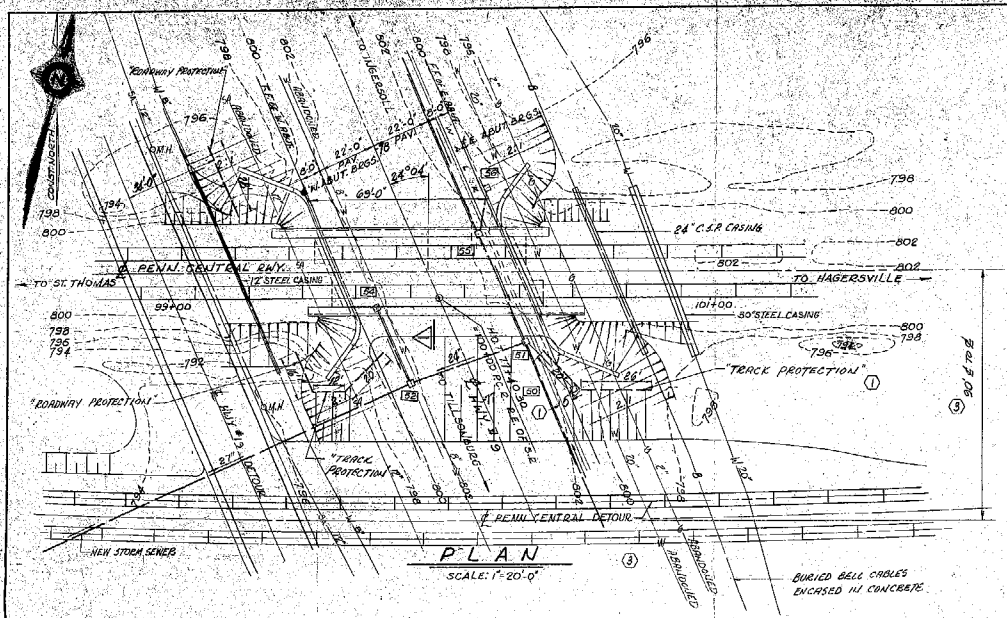
KING'S HIGHWAY No. 19 DIST. No. 2
CO. OXFORD MILEAGE 91.57 MAINLINE SUB. P.C.R.
Town of TILLSONBURG LOT 6 CON. 11

ABUTMENT PLAN - PILING & FOOTING LAYOUT

APPROVED — STRUCTURAL ENGINEER
SITE No. 23-308 W.P. No. 786-63-02

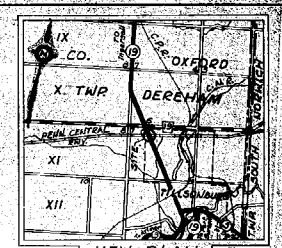
DESIGN	H.E.J.	CHECK	K.T.B.
DRAWING	H.E.J.	CHECK	K.T.B.
DATE	JULY 72	LOADING	ETZ

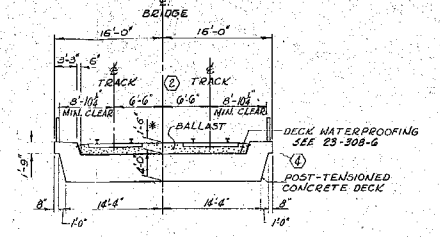
DRAWING No. 23-308-3



SKEW DATA - 24°04'

COS. 0.913072
SIN. 0.407739
TAN. 0.446624
SEC. 1.095204





SCALE: ⅜"=1'-0"

* 1'-6" MEASURED FROM BASE OF RAIL TO SURFACE OF CONCRETE.

B.M. 798.75

GEODETIC DATUM

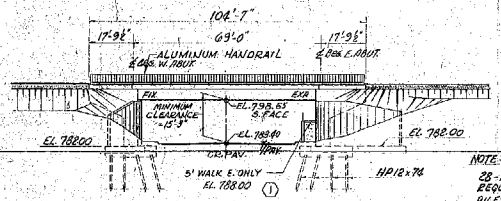
S.W. CORNER OF CONC. ISLE
53.0 RT. 70+03 'ESSO'.

GENERAL NOTES:

1. CLASS OF CONCRETE (5)
   - ABUTMENTS, WINGWALLS, DECK & CURBS — 4,000 p.s.i.
   - REMAINDER (INCLUDING RETAINING WALLS & CONCRETE FILL) — 3,000 p.s.i.
2. CLEAR COVER TO REINFORCING STEEL
   - DECK SLAB — 2" TOP, 1" BOTTOM
   - CURBS — 2"
   - REMAINDER — 3" OR AS NOTED
3. LOADING
   STRUCTURE DESIGNED FOR COOPER E 72 LOADING (INCLUDING DIESEL IMPACT). STRUCTURE DESIGNED TO A.R.E.A. SPECIFICATIONS.
4. CONSTRUCTION NOTES
   THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS TO THE ELEVATIONS SPECIFIED WITH A TOLERANCE OF ± ¼". NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED, STRESSED AND GROUTED.
5. DEFLECTIONS (5)
   MAX. DEFLECTION = 6" DOWNWARDS - TWO TRACKS LOADED

LIST OF DRAWINGS:

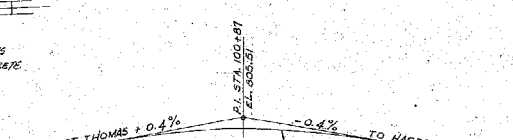
23-308-1 GENERAL ARRANGEMENT
- 2 BOREHOLE LOCATION & SOIL STRATA
- 3 ABUTMENT PLAN - PILING & FOOTING LAYOUT
- 4 ABUTMENT, STEM & WINGWALLS
- 5 RETAINING WALLS
- 6 DECK
- 7 CURBS & EXPANSION JOINT DETAILS
- 8 ALUMINUM HANDRAIL
- 9 EAST WALKWAY & RETAINING WALL
- 10 WALKWAY EAST WALL REINF. & BARRING DETAILS
- 11 STANDARDS



ELEVATION

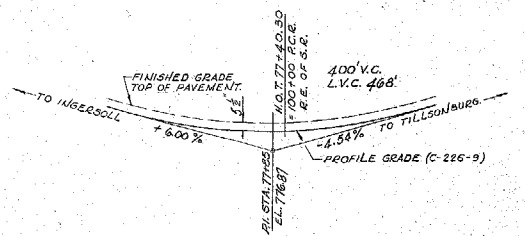
SCALE: 1"=20'-0"

NOTE:
28-HP12x78 STEEL H PILES REQUIRED FOR EACH ABUTMENT. PILES TO BE DRIVEN TO BEDROCK.



PROFILE OF PENN. CENTRAL RWY.

N.T.S.



PROFILE OF HWY. 19 (ALONG ℄)

N.T.S.

REVISIONS	DATE	BY	DESCRIPTION
	Nov/74	KTB	(5) Note re: Deflections
	Dec/74	KTB	(6) Pour Curbs with the Deck
	Jan/75	KTB	(3) Two Track Railway Loading
	Jan/75	KTB	(1) Change Length-Table
	Oct/75	KTB	(7) Track Protection, C.R.W.Y. Walkway Elev. & Loading

PRINT RECORD

No.	FOR	DATE

FOR REDUCED PLAN
USE SCALE BELOW
10 11 12 13
3 INCHES ON ORIGINAL PLAN

REGISTERED PROFESSIONAL ENGINEER K. T. HULLEN PROVINCE OF ONTARIO

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO

WOODSTOCK ENGINEERING CONSULTANTS LIMITED
WOODSTOCK, ONTARIO

PENN. CENTRAL RWY SUBWAY

0.2 MILES SOUTH OF TILLSONBURG NORTH LIMITS

KING'S HIGHWAY No. 19 — DIST. No. 2

CO. OXFORD — MILEAGE 91.52 MAINLINE CUM. RLA

TOWN of TILLSONBURG — LOT 6 — CON.

GENERAL ARRANGEMENT

APPROVED _____ DATE _____

SITE No. 23-308 — CONTRACT No. _____

DESIGN	K.T.B.	CHECK	J.A.M.	DRAWING No.	23-308-1
DRAWING	I.T.B.	CHECK	T.A.M.		
DATE	APRIL 74	J.O. No.	572		