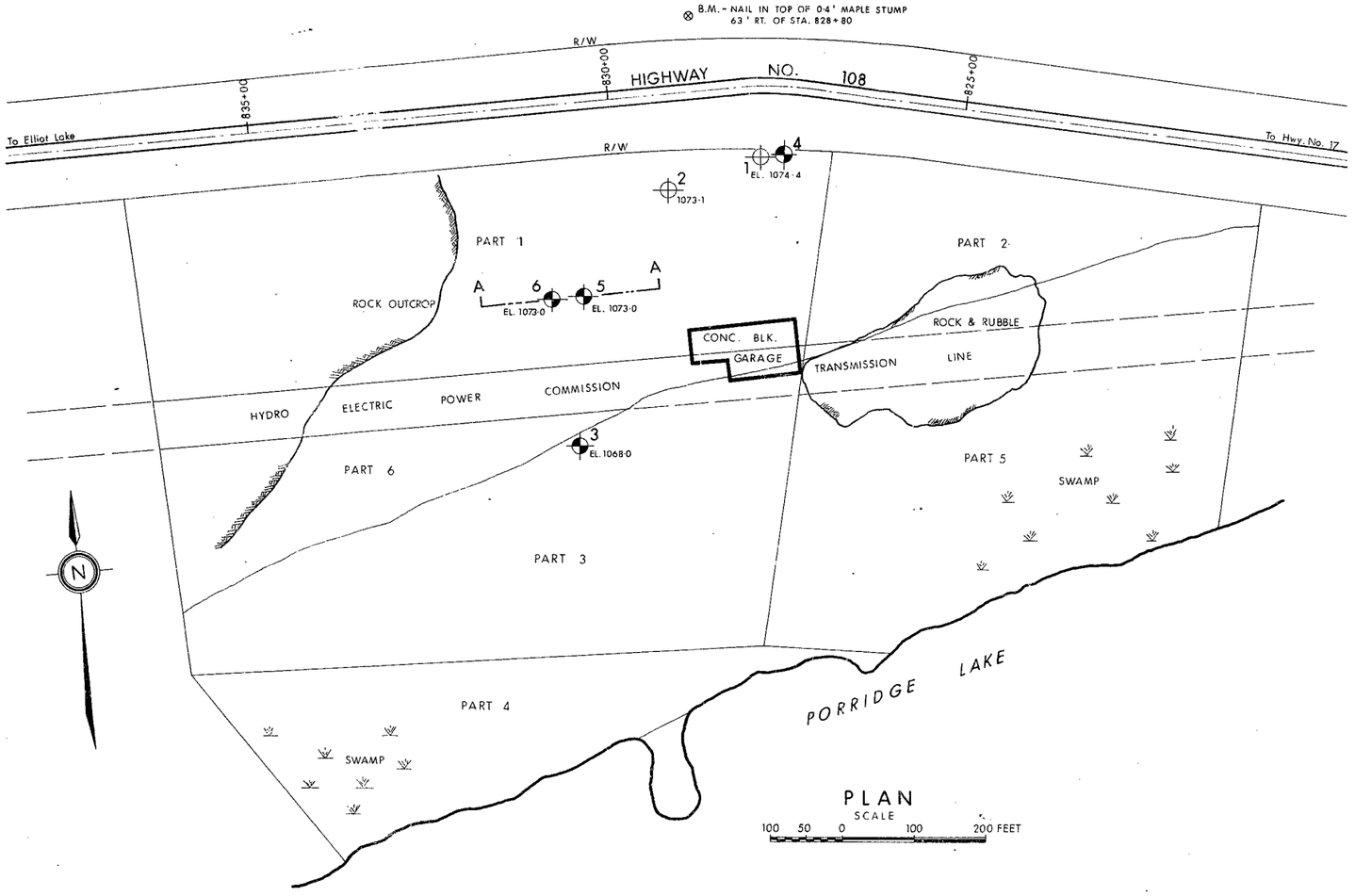
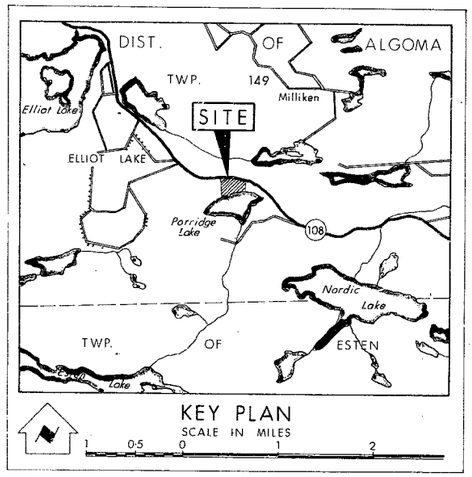
#65-F(R)-52
HWY. #108
D.H.O. PATROL
YARD
ELLIOT LAKE



PLAN

SCALE

100 50 0 100 200 FEET



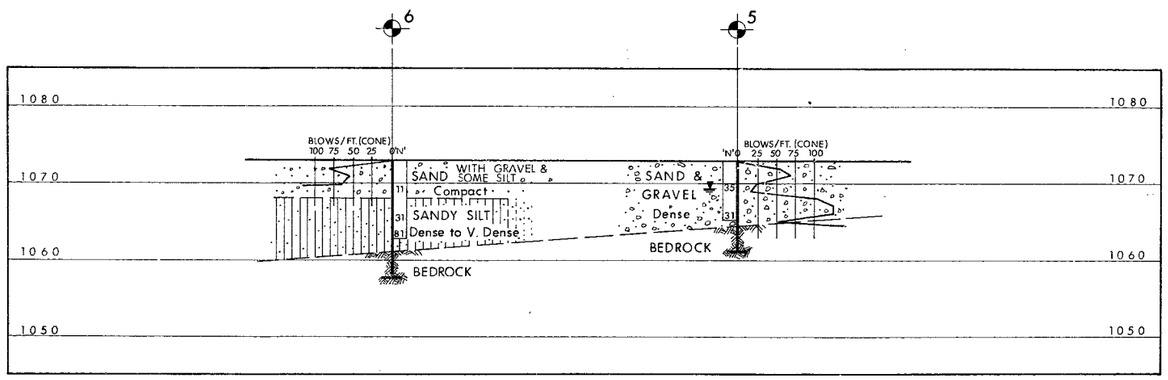
KEY PLAN

SCALE IN MILES

1 0·5 0 1 2

LEGEND

- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Level (22 May 1965)



SECTION A-A

SCALE

10 5 0 10 20 FEET

- 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.

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & RESEARCH SECTION

PROPOSED

ELLIOT LAKE PATROL YARD

SHOWING POSITIONS & ELEVATIONS OF HOLES

HWY. 108 DISTRICT 17 COUNTY ALGOMA

TOWNSHIP 149 LOT CON.

LOCATION 0·5 MILES SOUTH OF ELLIOT LAKE

DRAWN BY: S. O.	CHECKED BY:	W.P.
DATE 17 AUG. 1965	APPROVED BY:	DRAWING NO. 65-F(R)-52A
SCALE AS SHOWN		

REF. NO. P-3236-15

cc: GEN. FILES

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

Jul. 28-17.

To: Mr. C. S. Moase,
Manager,
Special Services Section,
Admin. Bldg.

From: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Date: July 15, 1965

Our File Ref.

In reply to

Subject:

FOUNDATION INVESTIGATION REPORT
For
D.H.O. Patrol Yard at Elliot Lake,
Hwy. #108, Township #149, District
of Algoma, District #17 (Sudbury).
W.J. 65-F(R)-52 - W.P. (Nil)

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

We believe that you will find the factual data and recommendations contained therein, adequate for your design requirements. Should you require additional information, please feel free to contact our Office.

K. Y. Lo,
SUPERVISING FOUNDATION ENGINEER

KYL/MdeF
Attach.
cc: Messrs. C. S. Moase (4)
E. J. Orr
D. W. Farren
T. A. Sharpe
E. R. Saint
A. Watt

Foundations Office
Gen. Files

FOUNDATION INVESTIGATION REPORT

For

D.H.O. Patrol Yard at Elliot Lake, Hwy. #108, Township #149, District of Algoma, District #17 (Sudbury).

W.J. 65-F(R)-52 - W.P. (Nil)

A request, dated March 24, 1965, for a foundation investigation at the site of a proposed Patrol Yard in Elliot Lake, was received by this Section from the Special Services Section.

The site itself, appears to be a disused building contractor's yard. It is roughly trapezoidal in shape, covering a total area of 23.42 acres and has mean dimensions of approximately 1,500' x 700'.

Roughly in the centre of this area is a large, 150' x 80', concrete block garage and adjacent to this and to the East is a large mound of soil, rock and concrete. This mound is about 30' high with a ground coverage of nearly 300' x 200'.

The extreme South-East and South-West corners of this site are swamp areas. Porridge Lake adjoins the site all along the Southern edge.

Bedrock outcrops occur in the North-West corner and at other random places throughout the site.

The area with which this investigation is concerned has dimensions of about 500' x 300' and occurs to the North and West of the existing garage.

cont'd. /2 ...

The topography in the vicinity of the site is undulating to hilly and consists mainly of bush with many lakes and outcrops of rock. Mining and forestry appear to be the main means of subsistence in this area.

Six dynamic cone penetration holes and four sampled boreholes were carried out during the course of the investigation. These are shown in detail in the Appendix to this report.

The subsoil at this site consists of silt to sand and gravel with some silt. The mean constituent makeup of this material is as follows: 9% gravel, 51% sand, and 40% silt and clay. The silt and clay fractions were grouped together for convenience, but in the writer's estimation, the mean clay fraction is no greater than 2%.

This material was yellowy-brown to browny-grey in colour, and has an extremely dense surface layer in the area in which the building is proposed. This upper surface layer is fill which extends to a maximum depth of 5' below ground level.

Bedrock occurs at 8' to 12.5' below ground level under the proposed building. Ground level in this area is between El. 1,073.1 and El. 1,074.4 and ground water exists at a minimum depth of 4' below ground level.

Recommended foundations for this site are spread footings founded on bedrock with a design bearing load of 10 tons/square foot.

A dewatering scheme may be necessary as foundations will be below ground water level.

It was observed that a 33' x 22' area of flat bedrock outcropped level with the surface about 100 ft. to the North-East

cont'd. /3 ...

of the proposed building and it is suggested that a 50-ft. change in position of the proposed building would result in foundations on bedrock about 5 ft. below ground level as opposed to the existing 8' to 12.5' below ground level, or with a 100-ft. move, the building could be built on surface bedrock.

These measures are obviously more economical with respect to the foundations and would have to be considered in relationship to the necessity of having the building in the exact location originally proposed.

The field work was carried out during May 18 to May 22, 1965, under the supervision of Mr. P.M.A. McGlone, Project Foundation Engineer, who also wrote this report. This project was under the general supervision of Mr. K. G. Selby, Senior Foundation Engineer, who also reviewed this report.

July 1965

APPENDIX I.

FORM OB-ML-126-REVISED
64-3040

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 65-F-52 LOCATION As shown on Drawing. ORIGINATED BY P. McG
W.P. BORING DATE May 21, 1965. COMPILED BY
DATUM Geodetic BOREHOLE TYPE NX Casing and BX Casing. CHECKED BY AR

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
1074.4	Silty fine sand with traces of gravel. (Boulders below 45'). Compact. Yellowy-Brown.		1	SS	20	1070				Gr3%Sa57% Si&Cl 40%
1066.9										
7.5	End of borehole.					1060				

FORM OB-ML-126-REVISED
64-3040

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 65-F-52 LOCATION As shown on Drawing. ORIGINATED BY P. McG
W.P. BORING DATE May 19, 1965. COMPILED BY
DATUM Geodetic BOREHOLE TYPE BX Casing - Washboring 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.	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
1068.0										
	Fine sand with silt and traces of gravel. Loose to compact. Yellowy-Brown.		1	SS	22					Gr4% Sa73% Si&Cl 23%
			2	SS	15	1060				
			3	SS	5					Gr1% Sa81% Si&Cl 18%
1056.0										
12.0	Silt with some sand and traces of clay. Loose to compact. Yellowy-Grey		4	SS	4					Gr0% Sa13% Si87% Cl 2%
			5	SS	18	1050				
1048.0										
20.0	Bedrock									
1044.0										
24.0	End of Hole									

FORM OB-ML-126-REVISED
64-3040

Dist. 38-17.

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 1 & 2

FOUNDATION SECTION

JOB 65-F-52 LOCATION As shown on Drawing. ORIGINATED BY P. McG
W.P. BORING DATE May 19, 1965. COMPILED BY
DATUM Geodetic BOREHOLE TYPE Cone Penetration Only. CHECKED BY

SOIL PROFILE 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.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
1074.4	(1) Groundlevel									
0.0										
1.6	End of cone test.					1070				
	(2)									
1073.1	Groundlevel									
1.6	End of cone test.					1070				

FORM OB-ML-126-REVISED
64-3040

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 65-F-52 LOCATION As shown on Drawing. ORIGINATED BY
W.P. BORING DATE May 22, 1965. COMPILED BY
DATUM Geodetic BOREHOLE TYPE BX Casing - Washboring. CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT
1073.0					
	Sand and gravel with some silt. Dense. Grey.		1	SS	35
			2	SS	31
1064.4					
8.6	Bedrock				
12.0	End of borehole.				

ELEV. SCALE: 1070, 1060

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100
SHEAR STRENGTH P.S.F.

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
Gr46%Sa47%
Si&Cl 7%

FORM OB-ML-126-REVISED
64-3040

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 65-F-52 LOCATION As shown on Drawing. ORIGINATED BY P. McG
W.P. BORING DATE May 22, 1965. COMPILED BY
DATUM Geodetic BOREHOLE TYPE BX Casing - Washboring. CHECKED BY HR

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	REMARKS
1073.0						
	Sand with gravel and some silt. Compact Brown (Fill)		1	SS	11	
1068.0						
5.0	Sandy-silt Dense to very dense. Browny-Grey		2	SS	31	Sa 39% Si 60% Cl 1%
			3	SS	81	
1061.0						
12.0	Bedrock					
1056.5						
16.5	End of Hole.					

ELEV. SCALE: 1070, 1060, 1050

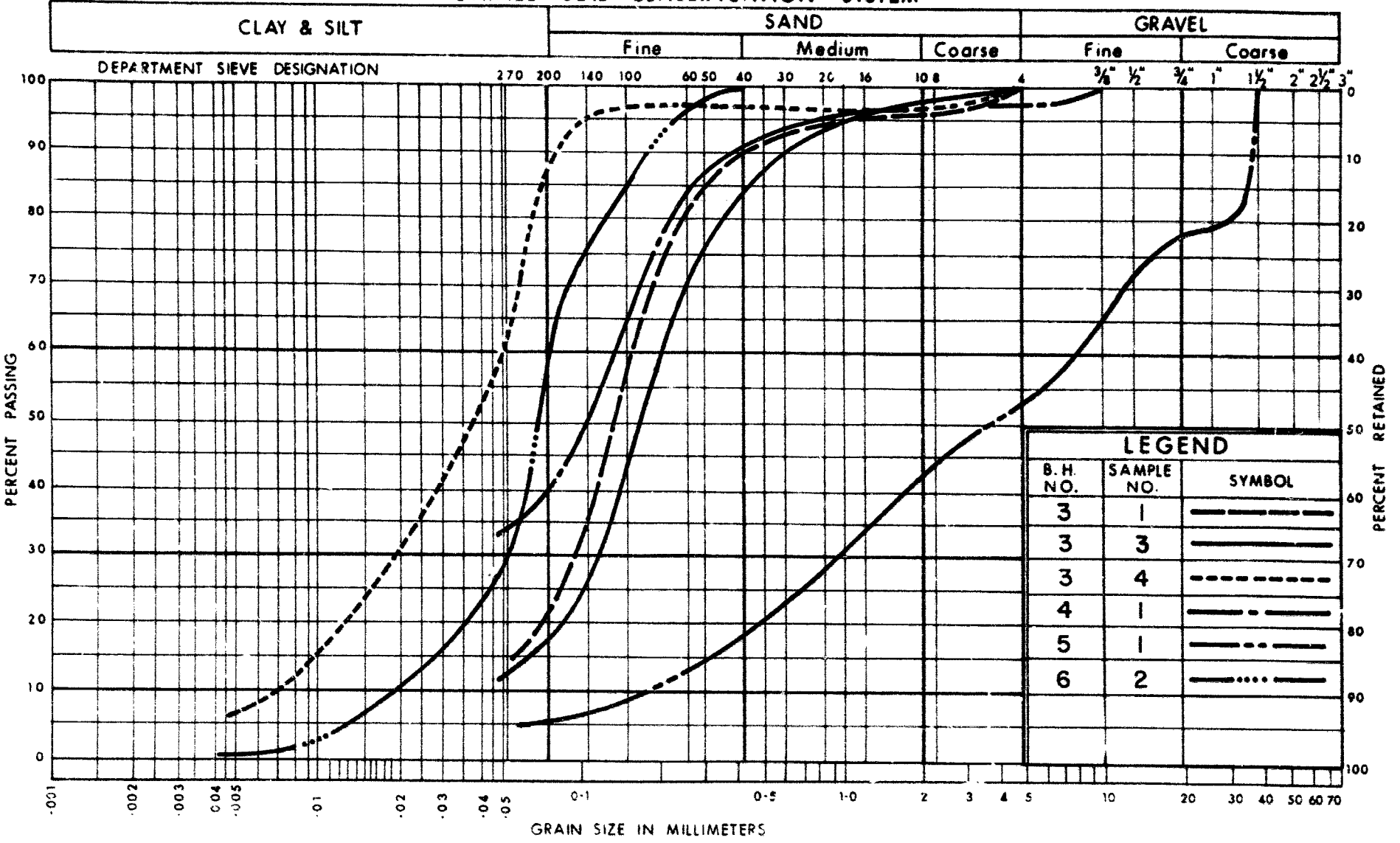
DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100
SHEAR STRENGTH P.S.F.

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

BULK DENSITY
γ
P.C.F.

FORM OB MT - 17
REV. APR. 1965
65-414

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION
ONTARIO

GRAIN SIZE DISTRIBUTION

W.P. No.

JOB No. 65-F(R)-52

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

64-69)

DEPARTMENT OF HIGHWAYS, ONTARIO
SERVICES BRANCH
SPECIAL SERVICES SECTION REQUISITION

65-F-52 (R)

REQUISITION NO. 0231

TO BE SHOWN ON ALL BILLINGS

Mr. A. Lutka, Mat.& Testing Eng.

TO: DISTRICT ENGINEER Dist. #17 DISTRICT: Att: N.D. Smith. DATE March 24th/65

NOTE: THIS FORM MUST BE USED FOR ALL PROJECTS FOR WHICH SPECIAL SERVICES ARE RESPONSIBLE

PLEASE INDICATE WHICH OF THE THREE FOLLOWING CATEGORIES APPLY

CATEGORY 1

AN EMERGENCY PROJECT
ALL PROJECTS OF THIS NATURE MAY BE UNDERTAKEN AT THE DISCRETION OF THE DISTRICT IN WHICH CASE THIS FORM WILL BE USED AS A CONFIRMING DOCUMENT ONLY.

CATEGORY 2

NORMAL MAINTENANCE
ALL PROJECTS OF THIS NATURE MAY BE UNDERTAKEN AT THE DISCRETION OF THE DISTRICT BUT EACH ITEM MUST NOT EXCEED AN ESTIMATED COST OF $200.00 IN WHICH CASE THIS FORM WILL BE USED AS A CONFIRMING DOCUMENT ONLY

CATEGORY 3

MAJOR PROJECTS (NON-EMERGENCY - EXCEEDING $200.00)
ALL PROJECTS OF THIS NATURE MUST BE APPROVED BY THE REGIONAL SPECIAL SERVICES INSPECTOR BEFORE UNDERTAKEN.

ITEM NO.	CATEGORY NO	DESCRIPTION - AN ACCURATE DESCRIPTION OF EACH ITEM IS REQUIRED	ESTIMATED COST	ACTUAL COST
	3	Please arrange for a Foundation Investigation of proposed Elliot Lake Patrol Yard. Enclosed, two (2) prints showing designated area.		
		Note: This work not to commence until the ground is frost free.		

MULTIPLE PROJECTS MAY BE INCLUDED ON ONE FORM PROVIDED THEY ARE CONCENTRATED AT ONE SITE

REQUIRED FOR

SIGNED

DEFECTS IN NEGATIVE DUE TO CONDITION OF ORIGINAL DOCUMENT