

MEMORANDUM

28-13

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

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

DATE: August 4, 1964

OUR FILE REF.

IN REPLY TO

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For

Proposed Patrol Yard, Hwy. #11, Dist.
of Nipissing, Twp. of Widdifield,
Con. 2, Lot 20, Dist. #13, North Bay.
W.J. 64-F-50 -- W.P. (Nil)

It is proposed to erect a D.H.O. Patrol Garage on Hwy. #11 approx. 4 miles North of the Town of North Bay. A request for a foundation investigation was received from Mr. R. H. Moran, dated June 8, 1964.

In order to determine the properties of the soil and decide on the type of foundations, an investigation was carried out by this Section. The field investigation was confined to four sampled boreholes.

The elevations, as well as the locations of the boreholes, are shown on Dwg. No. 64-F-50A, attached to this report.

The stratigraphy of the soil throughout the site, was found to be very uniform. The subsoil consists of dense to very dense silty sand.

The safe bearing pressure for spread footings, 2 feet wide, at a depth of 6 feet below ground level, is estimated to be 3 tons/sq.ft.

cont'd. /2 ...

August 4, 1964

At the time of the investigation, the ground water level was encountered approx. 11'-0" to 12"-0" below existing ground elevations.

The sand pile, at any location, may be built without danger of base failure.

Because of the granular and therefore permeable character of the subsoil, the probability of salt contamination is very real, and this fact should be kept in mind when final consideration is given to this site.

Attention is drawn to the existence of a well and public fishing pond located approx. 300 feet South and a 1/4 mile North-East, respectively.

The recommendations given by Mr. E. R. Saint, Regional Materials Engineer, for grading and paving, are as follows:

(1) Before any granular base is placed, all topsoil should be removed within 4 feet of finished grade. The average thickness of topsoil is 8 inches.

(2) The following granular depths are recommended:

a) If parking areas and driveways are to be founded directly over the very fine sandy loam soil, provide for 6 inches of G.B.C. Class "A" and 12 inches of sand cushion.

b) Where the above proposed works will be over the sands and gravels, provide for 6 inches of G.B.C. Class "A".

cont'd. /3 ...

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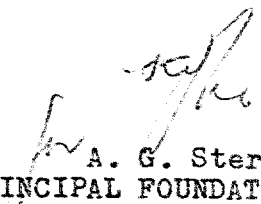
(3) In the event that location of driveways and/or parking areas is being considered over the organic terrain, it should be noted that supporting value of the mat is nil and the underlying organic material would have to be excavated and replaced with granular backfill down to firm bottom.

(4) The paving should consist of 2 inches of HL-4 binder course and $1\frac{1}{2}$ inches of HL-4 top course.

The field work performed during July 9, 1964, was undertaken by Mr. W. W. Kulmattickas, Project Foundation Engineer, who also prepared this report.

We believe the information contained in this report will suffice for your design work. However, should further information be required, please do not hesitate to contact our Office.

WWK/MdeF
Attach.


A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. C. S. Moase (4)
E. J. Orr
H. D. McMillan
G. Martens
E. R. Saint
A. Watt

Foundations Office
Gen. Files

APPENDIX I.

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 BY THE FOLLOWING TERMS:-

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

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	Q.S.	QESTERBERG 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

Q _u	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q _{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q _d	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
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_v	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

MEMORANDUM

P. O. Box 810, North Bay, Ontario

To: Mr. A. Rutka
Materials & Research Engineer
DOWNSVEIW.

FROM: R. H. Moran

DATE: June 8, 1964

OUR FILE REF.

IN REPLY TO

SUBJECT:

Proposed Patrol Yard
Lot 20, Concession 2,
Township of Widdifield,
— Highway #11, North Bay District #13 —

Attached please find Property Request Plan 64-3618 and
Purchase Order #1-49912.

Please arrange to have soils tests made on the above
property to ascertain if suitable for future erection of
a standard D.H.O. patrol garage.

RHM/rao
attach.

R. H. Moran
REGIONAL INSPECTOR SPECIAL SERVICES

NO COPY TO VENDOR SPECIAL SERVICES

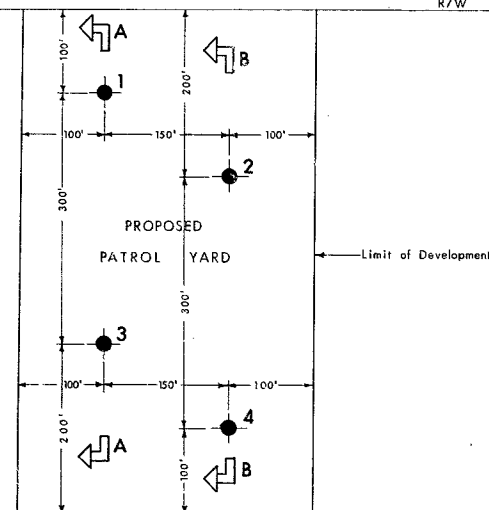
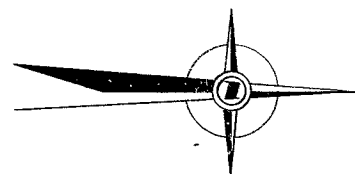
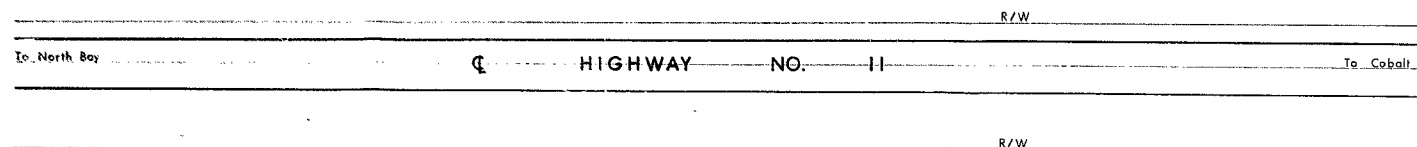
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HWY #11

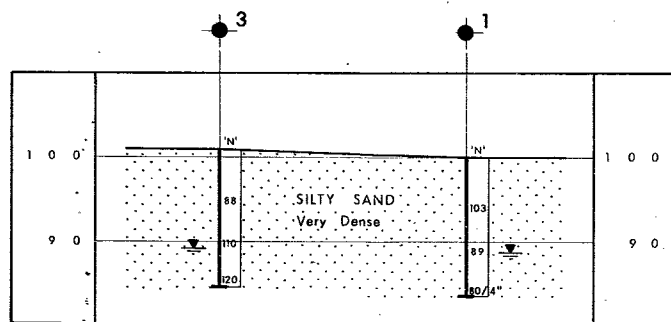
NORTH BAY

PATROL

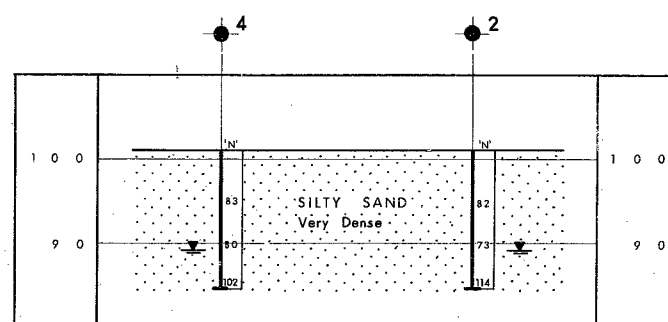
YARD



PLAN
SCALE
100 50 0 100 200 FT.

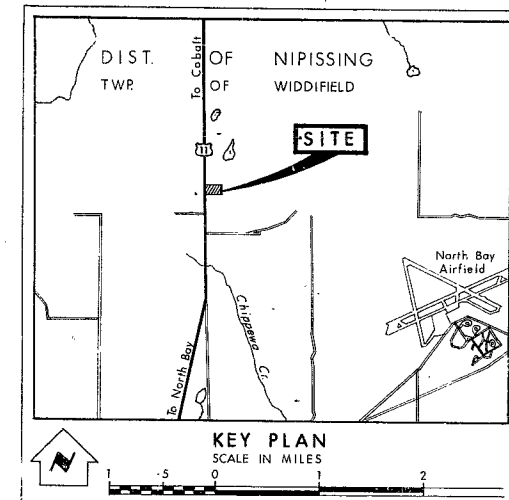


A - A



B - B

SECTIONS
SCALE
100 50 0 100 200 FT. HORIZONTAL
5 0 10 20 FT. VERTICAL



LEGEND

- Bore Hole
- ⊕ Cone Penetration Hole
- ⊕ Bore & Cone Penetration Hole
- Water Levels established at time of field investigation, (July 7, 1964)

NO.	ELEVATION	STATION	OFFSET
1	100.0		
2	101.0		
3	101.0		
4	101.0		

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

NORTH BAY PATROL YARD

SHOWING POSITIONS & ELEVATIONS OF HOLES

HWY. 11 DISTRICT 13 COUNTY DIST. NIPISSING
TOWNSHIP WIDDIFIELD LOT COIL
LOCATION APPROX. 4 MILES NORTH OF NORTH BAY
DRAWN BY: D. M. CHECKED BY: *[Signature]*
DATE 17 JULY 1964 APPROVED BY: *[Signature]*
SCALE AS SHOWN DRAWING NO. 64-F-50 A