

#64-F-81

Hwy. #20

PROP. EXTENSION
OF PATROL YD.

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

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

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

DATE: September 8, 1964

OUR FILE REF.

IN REPLY TO

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For

Proposed Extension of the Patrol Yard
 on Hwy. 20 and Pelham-Gainsboro Twp.
 Road, Lot 20, Con. 8, Pelham Twp.
 District No. 4

W.J. 64-F-81 -- W.P. (Nil)

It is proposed to build an extension to the existing Patrol Yard, at the above-mentioned site. A foundation investigation was requested by the Special Services Section in a requisition No. 0226, dated August 18, 1964.

In order to determine the subsoil conditions at the site and decide on the type and depth of footings, an investigation consisting of 3 sampled boreholes and three dynamic cone penetration tests was carried out. The locations of these boreholes are shown on Drawing No. 64-F-81A, which is attached to this report.

The subsoil conditions at the site are generally uniform and favourable. Below a thin layer of topsoil, is a layer of silty clay of medium plasticity. This layer of silty clay contains some fine sand at its upper surface and contains some layers of silt at a depth of 15 ft. or more below the ground surface. The material

cont'd. /2 ...

September 8, 1964

is generally firm to very stiff with 'N' values (Standard Penetration Test) ranging from a minimum of 6 blows to a maximum of 24 blows/ft. Average value of shear strength as measured by the field test may be taken as 1100 p.s.f. This stratum was investigated to a depth of 20 ft. - 6 inches below the ground surface. Due to the very low permeability of the subsoil material, the exact ground water level could not be measured at the time of this investigation.

It is recommended that the garage building, if required to be built, be supported on continuous strip footings, placed as high as frost conditions will allow. A safe load of up to one t.s.f. may be used for design purposes.

No stability problems are anticipated for any proposed sand pile locations.

Attention is drawn to the existence of a well on the site and another well at the existing Patrol Yard. Subsoil found in the boreholes is impermeable and no salt contamination problems due to underground seepage may occur. However, care should be taken to prevent any possible contamination of the well water by surface flow from the salt pile.

For purposes of granular and asphalt requirements for paving areas, reference may be made to a memo dated September 4, 1964, from Mr. T.J. Kovich, Regional Materials Engineer, as follows:

"This will advise that a detailed soils investigation will be carried out at this site at a later date when an approved plan has been received.

The report with our recommendations will be issued when this investigation has been completed."

cont'd. /3 ...

September 8, 1964

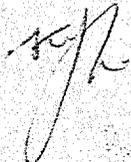
The field work was undertaken on September 1, 1964, under the supervision of Mr. B. M. Ghadiali, Project Foundation Engineer, of our Section, who also prepared this report. The equipment was owned and operated by Johnston Drilling Company of Toronto.

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 call on our Office.

BMG/MdeF
Attach.

cc: Messrs. C. S. Moase (4)
E. J. Orr
H. D. McMillan
H. Greenland
T. J. Kovich
A. Watt

Foundations Office ✓
Gen. Files


A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

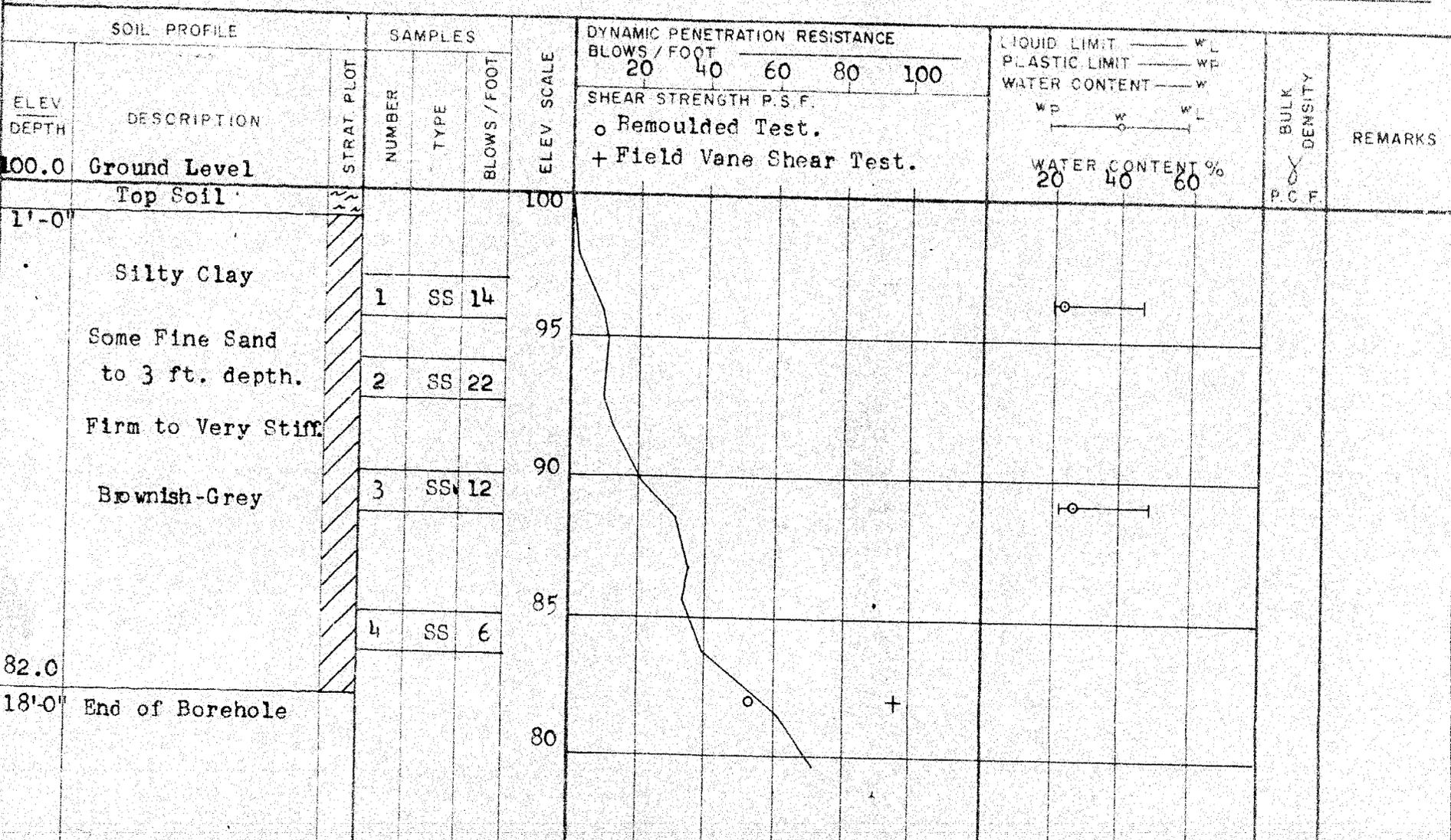
APPENDIX I.

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 64-F-81 LOCATION Lot 20, Con. 8, Pelham Twp. ORIGINATED BY B.M.G.
 W.P. - BORING DATE Sept. 1, 1964 COMPILED BY S.M.G.
 DATUM Assumed Elevation BOREHOLE TYPE Wash boring using BX casing. CHECKED BY K.Y. Lo



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 64-F-81 LOCATION Lot 20, Con. 8, Pelham Twp. ORIGINATED BY BM.G.
 W.P. - BORING DATE Sept. 2, 1964. COMPILED BY P.M.
 DATUM Assumed Elevation BOREHOLE TYPE Wash boring using BX casing CHECKED BY K.Y. Lo

SOIL PROFILE		STRAT. PLOT	SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION		NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.					WP	W	WL		
98.0	Ground Level															
	Top Soil															
0'-9"	Silty Clay															
	Trace of sand & root material to 3 ft. depth		1	SS	13											
	Stiff		2	SS	12											
	Brownish-Grey		3	SS	11											
			4	SS	8											
79.5			5	SS	14											
18'-6"	End of Borehole															

+ Field Vane Shear Test.
 o Remoulded Test
 200 400 600 800 1000

WATER CONTENT %
 20 40 .60

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 4

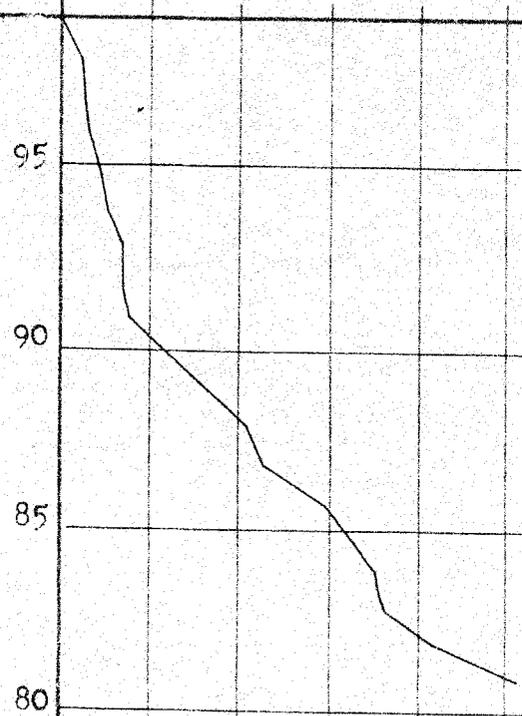
FOUNDATION SECTION

JOB 64-F-81
W.P. -
DATUM Assumed Elevation

LOCATION Lot 20, Con. 8, Pelham Twp.
BORING DATE Sept. 2, 1964.
BOREHOLE TYPE Dynamic Cone Penetration Test.

ORIGINATED BY B.M.G.
COMPILED BY B.M.G.
CHECKED BY K.Y.Lo

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— WL			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT	BLOWS / FOOT					WATER CONTENT ——— W			
						20	40	60	80	100	WP	W	WL	P.C.F.	
99.0	Ground Level														
0'-0"															
81.0															
18'-0"	End of Cone Test														



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 :-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</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	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

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_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 (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

651300E
4766500N

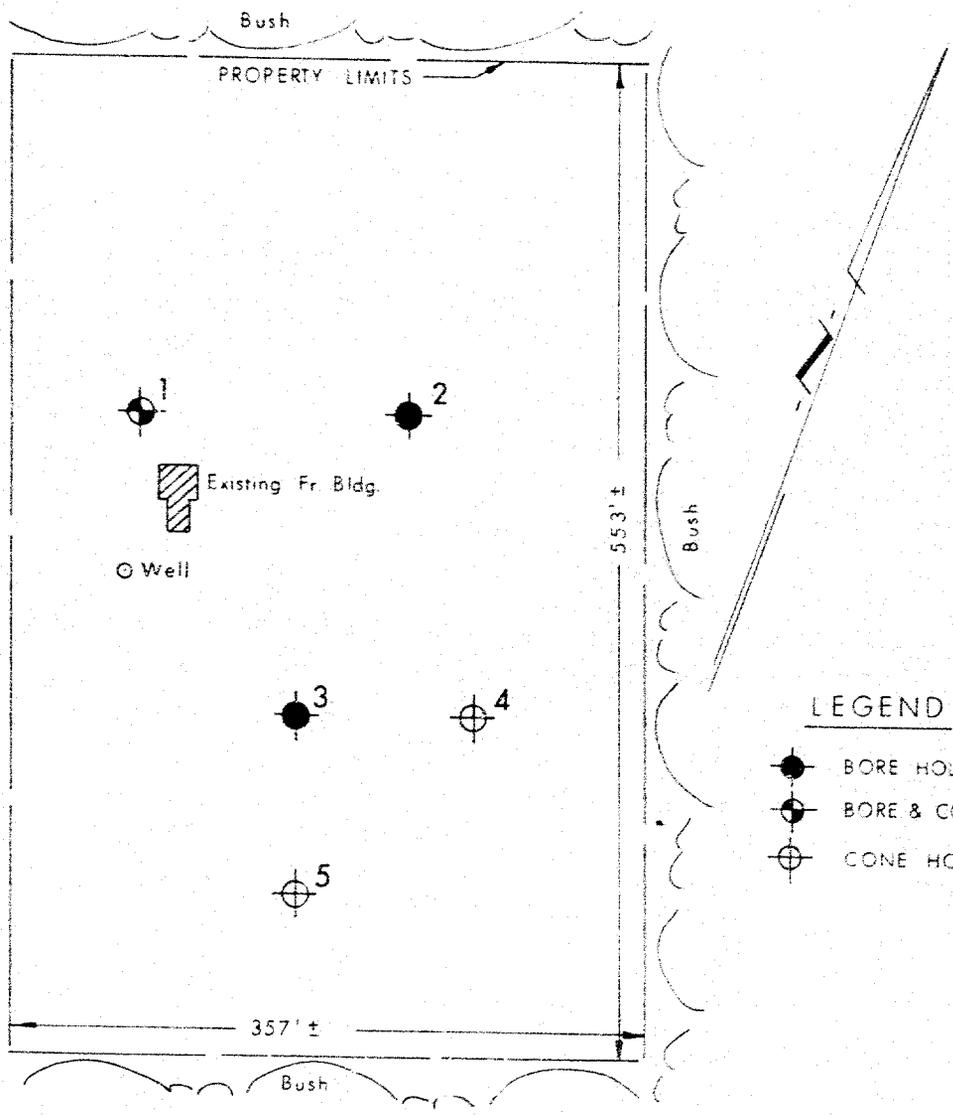
30N3W

HWY. NO. 20

CO. ~~LINCOLN~~ NIAGARA
TWP. PELHAM
LOT 20 CON. 8

EXISTING PATROL YARD

TWP. ROAD (BETWEEN GAINSBOROUGH & PELHAM) To Vineland



LEGEND

- BORE HOLE
- ⊙ BORE & CONE HOLE
- ⊕ CONE HOLE

NOTE REFER TO LOG SHEETS FOR BOREHOLE DETAILS.

ORIGINATED B G	DEPARTMENT OF HIGHWAYS - ONTARIO	SCALE 1IN = 100 FT.
DRAWN <i>LC</i>	MATERIALS & RESEARCH SECTION	W. P. NO.
CHECKED	PATROL YARD	JOB NO. 64-F-81
APPROVED <i>[Signature]</i>	5 MILES WEST of FONTHILL	DWG. NO 64-F-81A
DATE SEPT 4, 1964		

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. Stermac,
Principal Foundation Engr.

FROM: P.F. Weber

DATE: September 4th, 1964.

OUR FILE REF.

IN REPLY TO

64-F-81

SUBJECT:

Pt. Lot 20, Conc. VIII, Pelham Twp.,
- District #4 -

This will advise that a detailed Soils investigation will be carried out at this site at a later date when an approved plan has been received.

The report with our recommendations will be issued when this investigation has been completed.

PFW/hd
c.c. T.J. Kovich,
Files.


For: P.F. Weber,
T.J. Kovich,
Regional Materials Engineer.