

MEMORANDUM

cc: GEN. FILES

Dist. 28-1

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

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

DATE: NOV 3 1965

Our File Ref.

IN REPLY TO

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Proposed Additional Construction at
D.H.Q. Patrol Yard at Glenheim,
Fwy. #3 Lot 7, Conc. 1, Township of
Harwich, District #1 (Chatham)
W.J. 65-F(R)-105 -- W.P. (Nil)

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

We believe that the factual data and recommendations contained therein, will suffice for your design requirements. Should further information be required, please feel free to contact our Office.

AGS/MdeF
Attach.

cc: Messrs. C. S. Moase (4)
E. J. Orr
D. W. Farren
F. C. Brown
J. Roy
A. Watt

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

Foundations Office
Gen. Files ✓

FOUNDATION INVESTIGATION REPORT
For
Proposed Additional Construction at
D.H.O. Patrol Yard at Blenheim,
Hwy. #3, Lot 7, Conc. 1, Township of
Harwich, District #1 (Chatham)
W.J. 65-F(R)-105 -- W.P. (Nil)

It is proposed to construct a new 3-bay garage and to relocate the sand pile at the above D.H.O. Patrol Yard, located on Hwy. #3, 1.5 miles south of Blenheim. A request for a foundation investigation, dated August 10, 1965, was received from the Special Services Section.

Subsequently, a field investigation, consisting of 3 drilled boreholes, was carried out this Section. The locations and elevations of these boreholes are shown on Dwg. 65-F(R)-105A which accompanies this report.

A 12-in. surface layer of topsoil was found in all boreholes. This layer of topsoil was followed by a deposit of clayey silt with sand extending at least to the end of the boreholes. Standard Penetration Test (N) values in the stratum ranged from 23 blows/ft. to 58 blows/ft., from which a consistency of very stiff to hard may be estimated. Because of the relatively impermeable nature of the subsoil, it was not possible to determine the ground water levels during the time of the investigation.

It is recommended that the garage be supported on spread footings, placed as high in the clayey silt with sand stratum as frost conditions will permit. A safe bearing pressure

of 3 t.s.f. may be used for design purposes. No stability problems with regard to the sand pile are anticipated.

There are some wells in the vicinity of the Patrol Yard, the nearest being within the Yard, about 300 ft. from the salt sheds.

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

It is recommended that provision be made for 18 in. granular (6 in. G.B.C. "A" and 12 in. Sand Cushion) on both the driveway and parking yard areas. On the driveway this can be achieved by the addition of 9 in. granular (6 in. G.B.C. "A" and 3 in. Sand Cushion) or by excavation to provide for required granular depth. Any topsoil encountered within 3 ft. of profile grade should be removed and replaced with acceptable material up to the subgrade level. The Hot Mix pavement should consist of a 2-in. HL6 (modified) binder course and a 1½-in. HL6 (modified) surface course.

The field investigation, carried out September 24, 1965, together with the preparation of this report, was undertaken by Mr. R. Megi, Project Foundation Engineer. The project was under the general supervision of Mr. M. Devata, Senior Foundation Engineer, who also reviewed this report.

October 1965

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 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 - 6	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
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_f	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e \sigma$ OR $\ln \sigma$	NATURAL LOGARITHM OF σ
$\log_{10} \sigma$ OR $\log \sigma$	LOGARITHM OF σ 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

MEMORANDUM

To: Mr. A. Stermac,
Principal Foundations Engineer,
Materials & Testing,
Downsview

FROM: Materials & Testing,
London

DATE: September 15, 1965.

OUR FILE REF.

IN REPLY TO

SUBJECT: Re: Blenheim Patrol Yard, Lot 7, Concession I, Twp. Harwich

A hand auger investigation was carried out on the above mentioned patrol yard site on September 10, 1965. Boreholes were placed to a 3' depth through the existing gravel driveway surface and on the yard areas beside the driveway.

These boreholes indicate an average 9" depth of gravel over medium clay subsoil on the existing driveway. An average 10" clay loam topsoil was encountered on the yard areas beside the existing driveway.

It is recommended that provision be made for 18" granular (6" G.B.C. "A" and 12" sa. cu.) on both the driveway and parking yard areas. On the driveway this can be achieved by addition of 9" granular (6" G.B.C. "A" and 3" sa. cu.) or by excavation to provide for the required granular depth. Any topsoil encountered within 3' of profile grade should be removed and replaced with acceptable material up to the subgrade level. The hot mix pavement should consist of a 2" H.L. 6 (modified) binder course and a 1½" H.L. 6 (modified) surface course.

The closest available G.B.C. Class "A" material is situated in the commercial sources 5 miles south-east of Chatham at an average 10 mile haul and the closest available sand cushion is situated in a beachline formation which runs east and west through Blenheim at an average 2 mile haul.

AMB/jb
cc: F.C. Brown
A. Gater
G.A. Wrong
file

A.M. Batten
A.M. Batten
for: J.R. Roy
Regional Materials Engineer

MEMORANDUM

To: Mr. A. Stermac,
Principal Foundations Engineer,
Materials & Testing,
Downsview

FROM: Materials & Testing,
London

DATE: September 15, 1965.

OUR FILE REF.

IN REPLY TO

SUBJECT: Re: Harrow Patrol Yard, Lot 1, Conc. II, Colchester
Twp. Hwy. #18.

A hand auger investigation was carried out on the above mentioned patrol yard on September 8, 1965. Boreholes were placed to a 4' depth through the existing gravel driveway and on the parking yard areas beside the driveway.

On the parking yard areas beside the driveway an average 12" sandy loam topsoil was encountered over frost susceptible very fine sandy loam subsoil material. The subsoil material was in a saturated condition at 30" below ground level when the investigation was carried out. On the existing driveway and yard the existing gravel depth over the topsoil material varies from 10" near the yard entrance to 5" near the existing salt shed.

It is recommended that provision be made for 24" granular (6" G.B.C. "A" and 18" sa. cu.) on this patrol yard. Any topsoil encountered within 3' of profile grade should be removed and replaced with acceptable material up to the subgrade level. The hot mix asphalt pavement should consist of a 2" H.L. 6 (modified) binder course and a 1½" H.L. 6 (modified) surface course. It is also recommended that a 6" sub drain pipe be installed around the edges of the area which is to be paved. This pipe should be placed 1' below the subgrade with an outlet to the adjacent road drainage.

The closest available G.B.C. Class "A" material is situated in the commercial quarries near Amherstburg at a 14 mile haul and the closest available sand cushion is located approximately 2 miles south-east of Harrow at a 5 mile haul.

AMB/jb
cc: F.C. Brown
A. Gater
G.A. Wrong
file

A.M. Batten
A.M. Batten
for: J.R. Roy
Regional Materials Engineer

WAYS, ONTARIO
BRANCH
SERVICES SECTION REQUISITION

Nov 15/65

REQUISITION NO. 2274

TO BE SHOWN ON ALL BILLINGS

Mr. A. Butka
Materials & Testing Engineer

TO: DISTRICT ENGINEER

DISTRICT: Dorchester

DATE August 10, 1965

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
1	2.	Please conduct complete soils investigation at site of the Blenheim Patrol Yard. Yard location: Lot 7, Concession 1, Township of Harwich, County of Kent, Highway No. 3. Buildings presently located on site are: 1. Patrol Office. 2. Salt Shed. 3. 120A Salt Shed.		
		For Special Services Use Only.		
		Received from RD Smith August 16/65		

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

REQUIRED FOR Blenheim Patrol
Chatham District.

REQUESTED BY

SIGNED
DISTRICT ENGINEER

SIGNED
REGIONAL SPECIAL SERVICES INSPECTOR

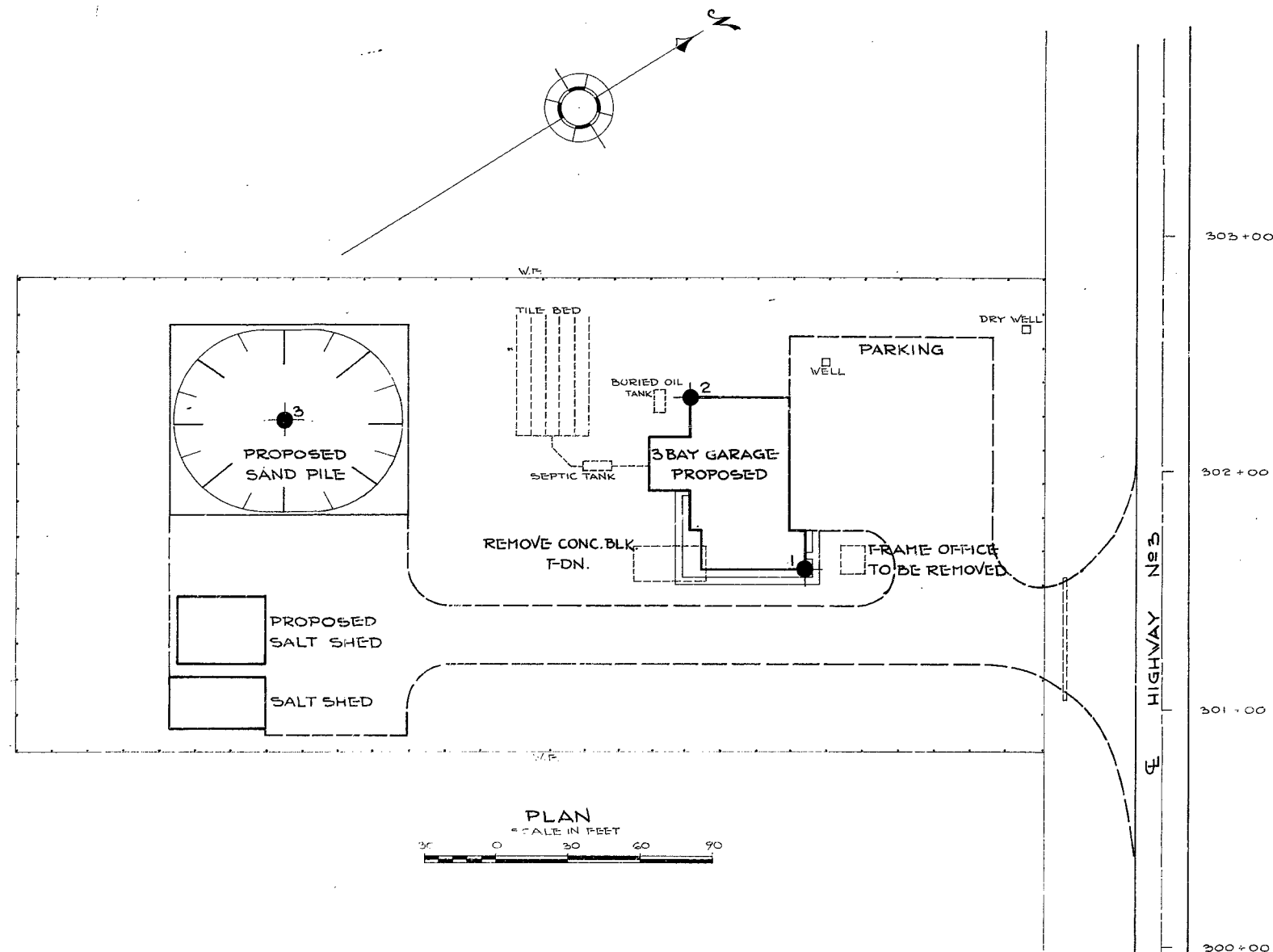
#65-F-(R)-105

HWY #3

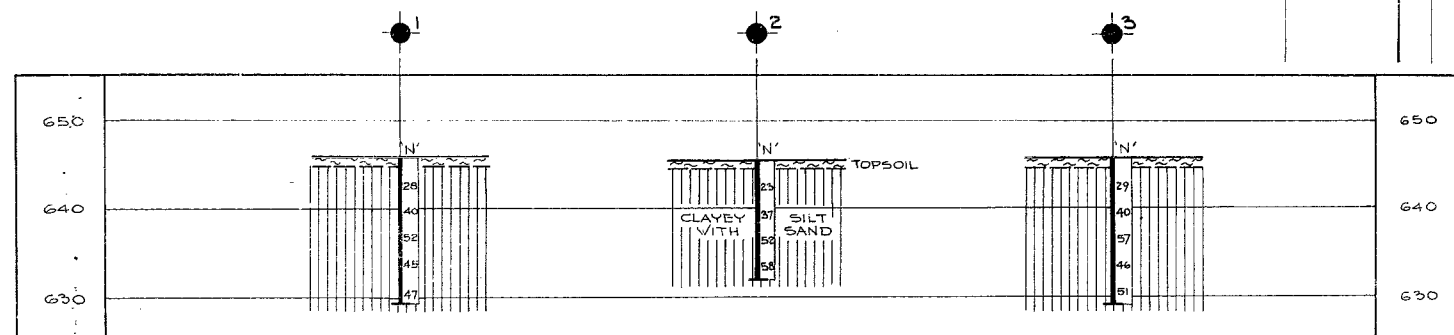
BLENHEIM

PATROL

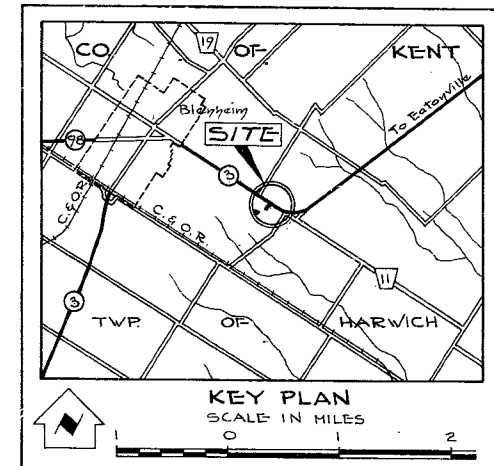
YARD



PLAN
SCALE IN FEET
0 30 60 90



BOREHOLE STRATIGRAPHY
SCALE IN FEET
0 10 20 30



E. 418000
N. 4685900
ZONED 17

BORE HOLE

- 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		
BLENHEIM PATROL YARD		
SHOWING POSITIONS & ELEVATIONS OF HOLES		
HWY. 3	DISTRICT 1	COUNTY KENT
TOWNSHIP HARWICH	LOT 6	CON. I.W.C.R.
LOCATION 1.3 MI. SOUTH-EAST OF BLENHEIM		
DRAWN BY: DGH	CHECKED BY: [Signature]	W.S.
DATE 25 OCT/65	APPROVED BY: [Signature]	DRAWING NO.
SCALE AS SHOWN		65-FR105A