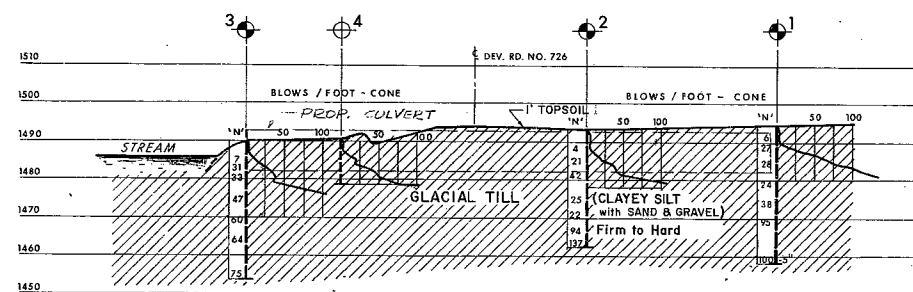
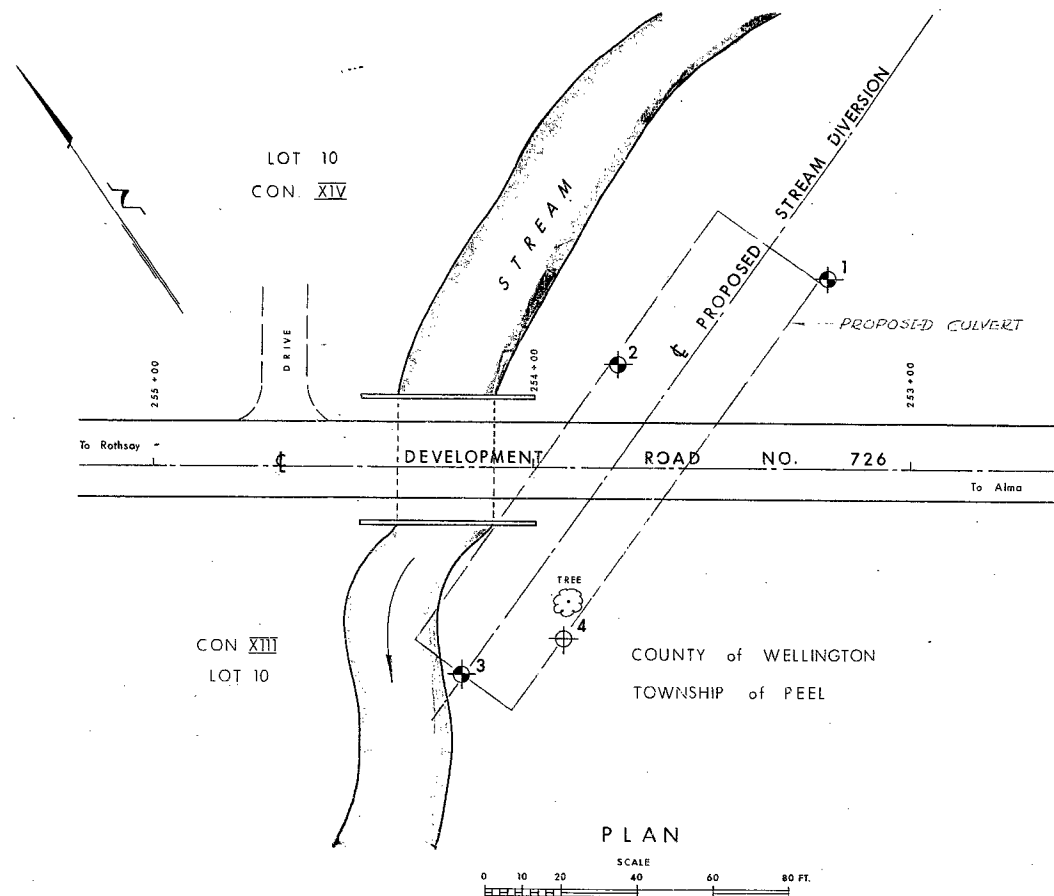


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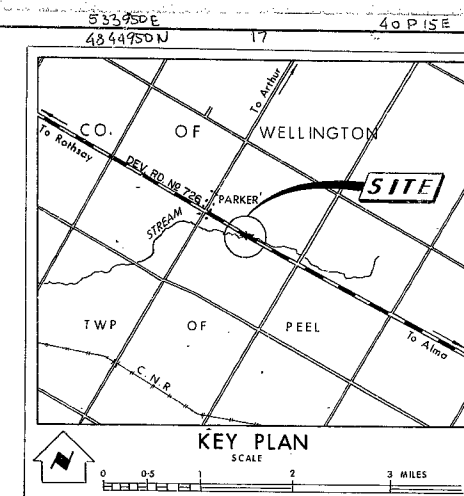
DEV. RD. #726

PROP. STREAM

DIVERSION



PROFILE - PROPOSED CULVERT



LEGEND

- Bore & Cone Penetration Hole
- Cone Penetration Hole
- Water Levels established Nov. 18, 1964

NO.	ELEVATION	STATION	OFFSET
1	1495.0	253+22	50' RT.
2	1493.5	253+78	27' RT.
3	1490.0	254+18	55' LT.
4	1491.0	253+92	45' LT.

DEPARTMENT OF HIGHWAYS - ONTARIO		
MATERIALS & RESEARCH SECTION		
PROPOSED STREAM DIVERSION		
J.A. 253+79		
DEVELOPMENT ROAD NO. 726		
ORIGINATED V.R.	DISTRICT NO. 3	DATE NOV. 25, 1964
DRAWN <i>[Signature]</i>	W.P. NO.	JOB NO. 64-F-97
CHECKED <i>[Signature]</i>	SCALE	DRAWING NO.
APPROVED <i>[Signature]</i>	AS SHOWN	64-F-97A

MEMORANDUM

Dist. 28-3.

To: Mr. A. M. Teye,
Bridge Engineer,
Bridge Division.

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

Attn: Mr. K. L. Kleinsteinber,
Mun. Bridge Liaison Engr.

DATE:

OUR FILE REF.

IN REPLY TO

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For

New Bridge on Development Road No.726,
Wellington County, Peel Township
Con. 13/14, Lot 10, District No. 3
W.J. 64-F-97 -- W.P. (Nil)

At the request of Mr. T. J. Kovich, Regional Materials Engineer, memo dated October 23, 1964, a foundation investigation was carried out at this site.

The field work consisted of three sampled boreholes and four dynamic cone penetration tests. The field investigations indicate that the subsoil at this site is very uniform. Under the topsoil, the material, proved down to 35 ft., is clayey silt with occasional pieces of gravel (glacial till). The upper 5 ft. of the subsoil is firm becoming very stiff to hard with depth.

The properties of the subsoil measured in the laboratory are as follows:

Liquid Limit	--	19% - 33%
Plastic Limit	--	13% - 23%
Moisture Content	--	8% - 32%

cont'd. /2 ...

January 5, 1965

No ground water was observed in any of the boreholes during the time of investigation.

The subsoil conditions are favourable for spread footing type foundation support. It is recommended that a safe design load of 3 t.s.f. be used for spread footings. The footings could be placed anywhere 6 ft. below the existing ground level in order to provide adequate frost protection.

No major dewatering problems are anticipated during construction of the structure footings.

The field work was carried out during November 16 to November 19, 1964, under the supervision of Mr. V. Korlu, Project Foundation Engineer, who also wrote this report. The report was reviewed by Mr. M. Devata, Senior Foundation Engineer.


The field equipment was provided by Canadian Longyear Co. Ltd. of Toronto.

VK/MdeF
Attach.

cc: Messrs.

A. M. Toye (3)
P. D. Patterson
W. H. Keith (County Engr.)
J. G. Tillicock (Attn: W. H. Venn)
J. Roy
T. J. Kovich

Foundations Office
Gen. Files


A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

APPENDIX I.

MATERIALS & TESTING DIVISION

FOUNDATION SECTION

LOCATION Sta. 253+22 50' Rt.

ORIGINATED BY V.K.

BORING DATE Nov. 16, 1964.

COMPILED BY ... V.K.

BOREHOLE TYPE Drive BX Casing & Wash.

CHECKED BY

SOIL PROFILE		SAMPLES		ELEV SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT ———— w_L	BULK DENSITY	REMARKS				
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE		BLOWS / FOOT	BLOWS / FOOT			PLASTIC LIMIT ———— w_p			
						20			40	60	80	100
					SHEAR STRENGTH P.S.F.	w_p ———— w ———— w_L						
					+ Field Vane							
					400	800	1200	1600	2000	WATER CONTENT %		
										10	20	30
1495.0												
1494.0	Topsoil											
1.0		1	SS	6	1490							
	Glacial Till (clayey silt with sand and gravel).	2	SS	27								
		3	SS	28								
		4	SS	24	1480							
		5	SS	38								
		6	SS	95	1470							
	Firm to hard.											
1458.5		7	SS	100 for	1460							
36.5				5"								

MATERIALS & TESTING DIVISION

FOUNDATION SECTION

JOS 64-F-97

LOCATION Sta. 253+78 27' Rt.

ORIGINATED BY V.K.

W. P.

BORING DATE Nov. 17, 1964.

COMPILED BY V.K.

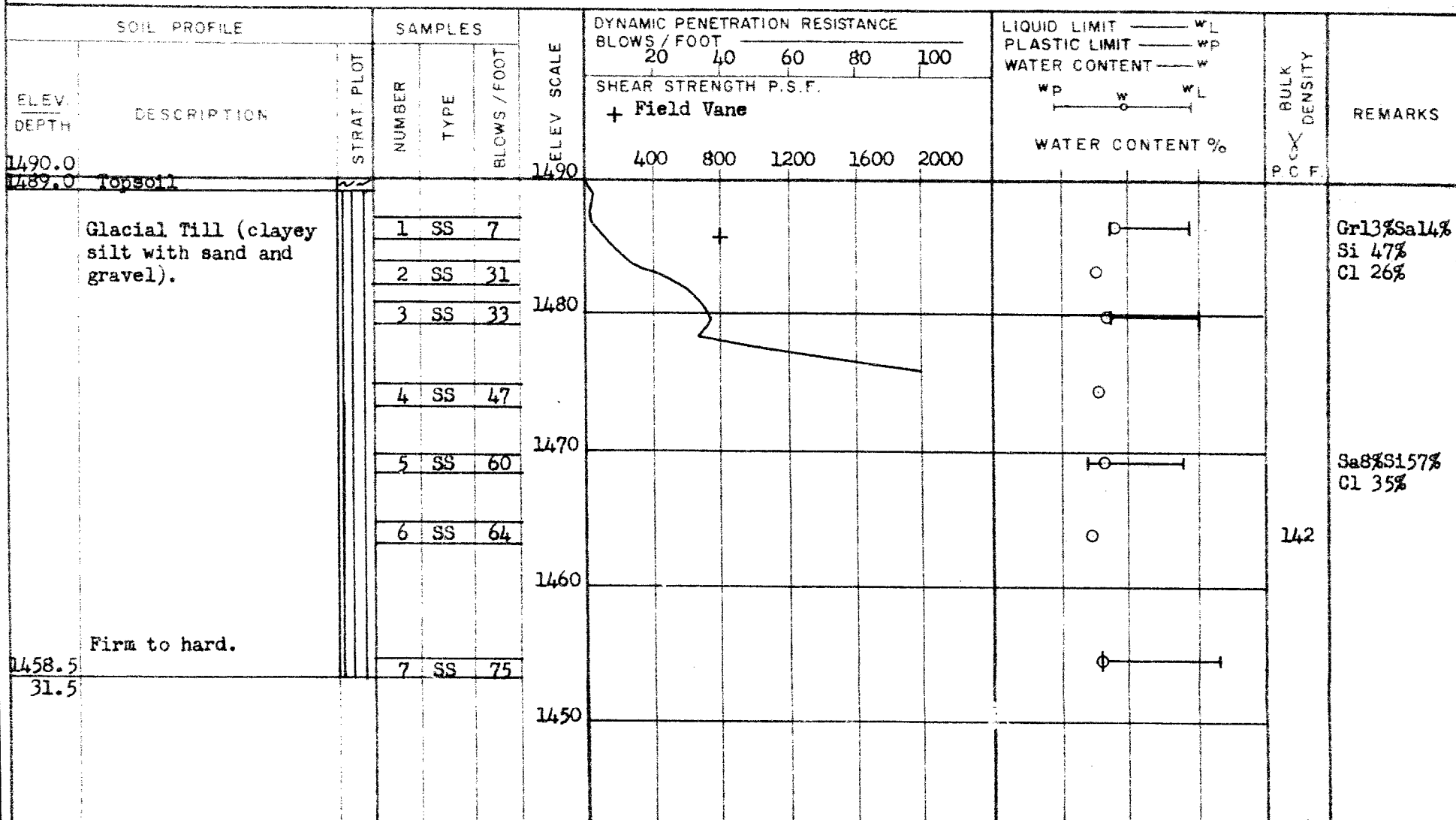
DATUM Geodetic

BOREHOLE TYPE Drive BX Casing & Wash.

CHECKED BY M. A.

SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— wp WATER CONTENT ——— w			BULK DENSITY PCF	REMARKS		
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	BLOWS / FOOT	20	40	60	80	100			wp	w
							SHEAR STRENGTH P.S.F. + Field Vane					WATER CONTENT % 10 20 30				
1493.5								400	800	1200	1600	2000				
1492.5	Topsoil															
	Glacial Till (clayey silt with sand and gravel).		1	SS	4		1490							I		
			2	SS	21											
			3	SS	42									O		
							1480									
				4	SS	25									Φ	I
				5	SS	22		1470							O	
	Firm to hard.		6	SS	94									O		
1462.0			7	SS	137		1460								O	I
31.5																

CHECKED BY ML



DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 64-F-97

LOCATION Sta. 253+92 45' Lt.

ORIGINATED BY V.K.

W. P. _____

BORING DATE Nov. 19, 1964.

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Drive BX Casing and Wash.

CHECKED BY MZ

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w _L		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	BLOWS / FOOT	WATER CONTENT ——— w	WATER CONTENT %			
1491.0 0.0						1490	400 800 1200 1600 2000				
1478.0 13.0						1480					
						1470					

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

V. R. ASTROP
CONSULTING ENGINEER

64-F-97

ANCASTER PLAZA
ANCASTER, ONT.

PHONE 648-2022
RES. ANCASTER
PHONE MI 6-2297

FILE NO. 34

December 2, 1964.

Mr. A. Stermac,
Principal Foundation Engineer,
Materials and Research Section,
Department of Highways,
401 North Keele Street,
Downsview, Ontario.

Dear Sir:

Re: Structure No. 6, Station 253+80
Development Road 726.

We recently had a query from Engineers in your section in regard to the layout we had shown on our drawing No. 10 for the above noted structure. We suggested at the time of the conversation that your engineers should use a roadway elevation of 1494.8 at the centre line of the existing structure. This is now confirmed.

Our drawing No. 10 is incorrect in that it shows the underside of the existing slab at the wrong elevation. All of the other information on the drawing is correct according to recent further field investigation.

Your engineers stated that they discovered the underside of the existing slab to be 2 feet below the roadway elevation. Our field investigation shows that the underside of this slab is 3 feet below the road elevation, however, if you use the aforementioned elevation of 1494.8, as your reference point, you should be alright.

Yours truly,

VR Astrop

VRA:mr

V.R. Astrop P. Eng.

MEMORANDUM

To: Mr. T. J. Kovich,
Regional Materials Engineer, Toronto,
Lab. Building,
Downsview

FROM: K. L. Kleinsteinber

DATE: October 23, 1964.

64-F-97

OUR FILE REF.

IN REPLY TO

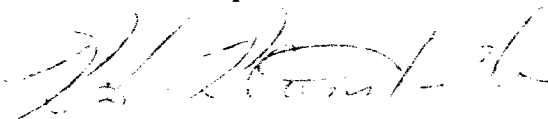
SUBJECT: Wellington County - Structure Site No. 35-180
Development Road No. 726,
Lot 10, Con. XIII/XIV, Twp. of Peel.

STRATFORD

The Consultant, V. R. Astrop, has designed a double 15' x 8' Rigid Frame culvert on spread footings for this site. The culvert is on a skew and is under eight feet of fill.

The Development Road project is scheduled for construction next year and on the advice of the consultant we wish to request a foundation investigation at this site. We are enclosing a set of plans which we approved as noted earlier this month.

We would appreciate the return of the plans to this office when the foundation report is completed.


K. L. KLEINSTEIBER
MUNICIPAL BRIDGE LIAISON ENGINEER.

KLK*DW.

c.c. to Mr. P. Patterson and Mr. W. H. Venn.

64-F-97