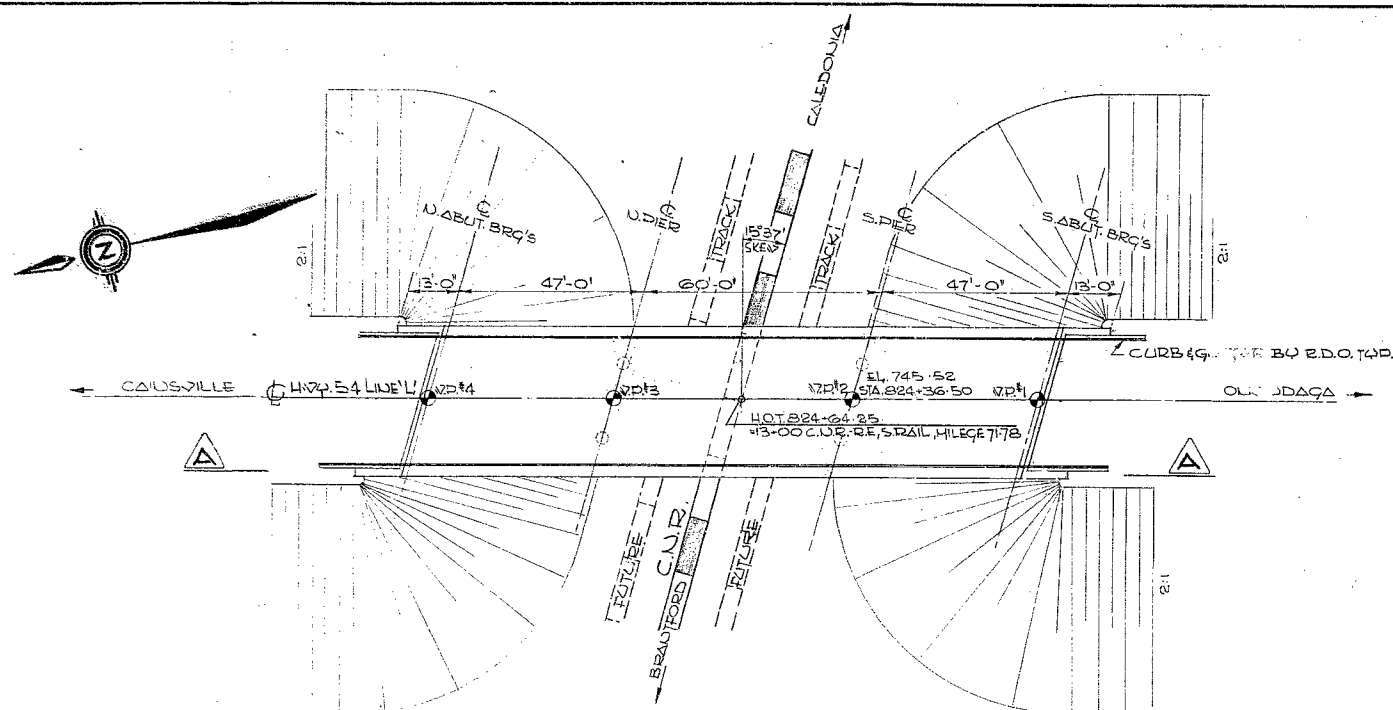


#69-F-25

W.P. 310-66

HWY. #54, LINE 'L'

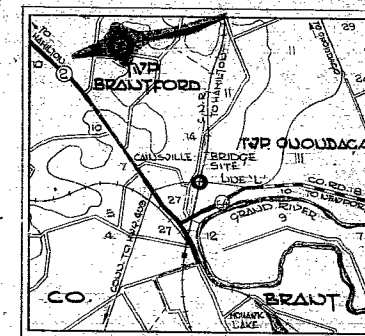
C.N.R. OVERHEAD



PLAN
SCALE: 1" = 20' 0"

<p>SKEN 15° 37'</p> <p>SIN. = 0.2692000</p> <p>COS. = 0.9630843</p> <p>TAN. = 0.2795186</p> <p>SEC. = 1.0383307</p>

- LIST OF DRAWINGS
- D-6720-1 GENERAL PLAN
-2 BORE HOLE LOCATIONS & SOIL STRATA
-3 FOOTING LAYOUT
-4 ABUTMENTS & WINGWALLS
-5 PIERS
-6 PRESTRESSED BOX GIRDERS
-7 DECK
-8 PARAPET RAIL DETAILS
-9 STD. PARAPET RAIL
-10 STD. DETAILS



KEY PLAN
SCALE: 1 in = 1 mi.

NOTES

CLASS OF CONCRETE

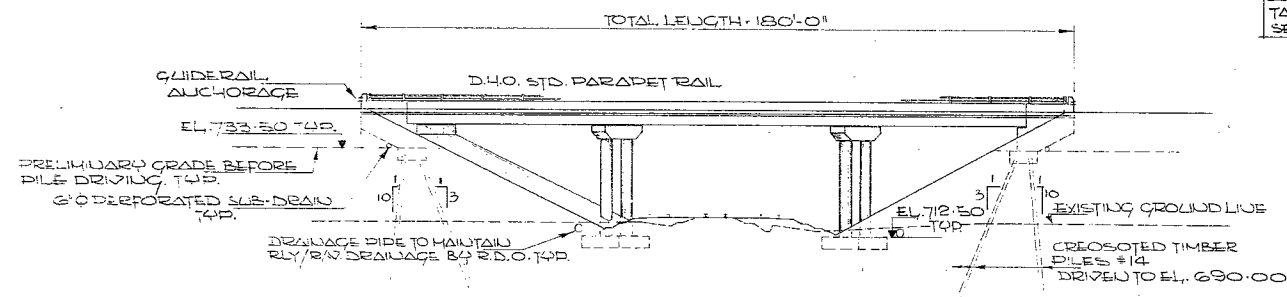
PRESTRESSED BOX GIRDERS	5000 P.S.I.
DECK, CURBS, PARAP WALLS, PIER CAPS & COL'S	4000 P.S.I.
REMAINDER	3000 P.S.I.

CLEAR COVER ON REINFORCING STEEL

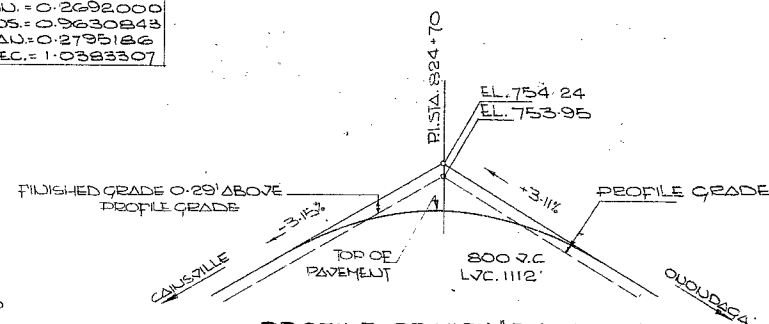
FOOTINGS & ABUTMENTS 3"; PIERS 2" & AS NOTED
DECK 1 1/2" TOP & BOT.; CURBS 2"
PARAPET WALLS 1 1/2"

CONSTRUCTION NOTES

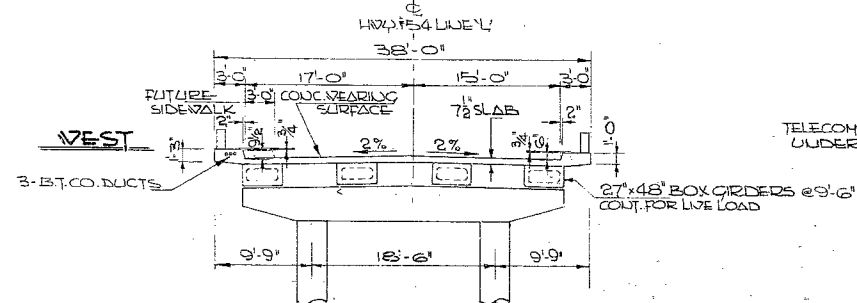
- CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS TO THE SPECIFIED ELEV. WITH A TOLERANCE OF $\pm 1/8"$
- NO CONCRETE SHALL BE PLACED ABOVE THE BEARING SEATS UNTIL CONCRETE IN DECK HAS BEEN PLACED.



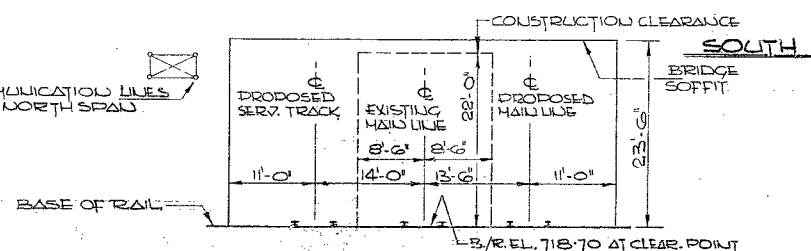
ELEVATION Δ-A
SCALE: 1"=20'-0"



PROFILE OF H74#54 - LINE 'L'



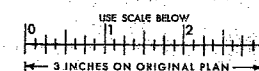
CROSS SECTION
SCALE: 1/8" = 1'-0"



RAILWAY CLEARANCE DIAGRAM
PERPENDICULAR TO TRACK
NOT TO SCALE



FOR REDUCED PLAN

[illegible]

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

- 69-F-11

C.N.R. OVERHEAD

0.2 MILES SOUTH OF HWY. #2

KING'S HIGHWAY No. 54

DIST. No. 4

CO. BRANT

MILE 71.78 DULINVILLE SUBDIVISION

TWP. ONONDAGA

LOT 1 CON. III V.F.C.

GENERAL PLAN

SITE No.	W.P. No.
----------	----------

APPROVED _____

1-165	310
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DESIGN		CHECK		P E H	
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CONTRACT			
No.			

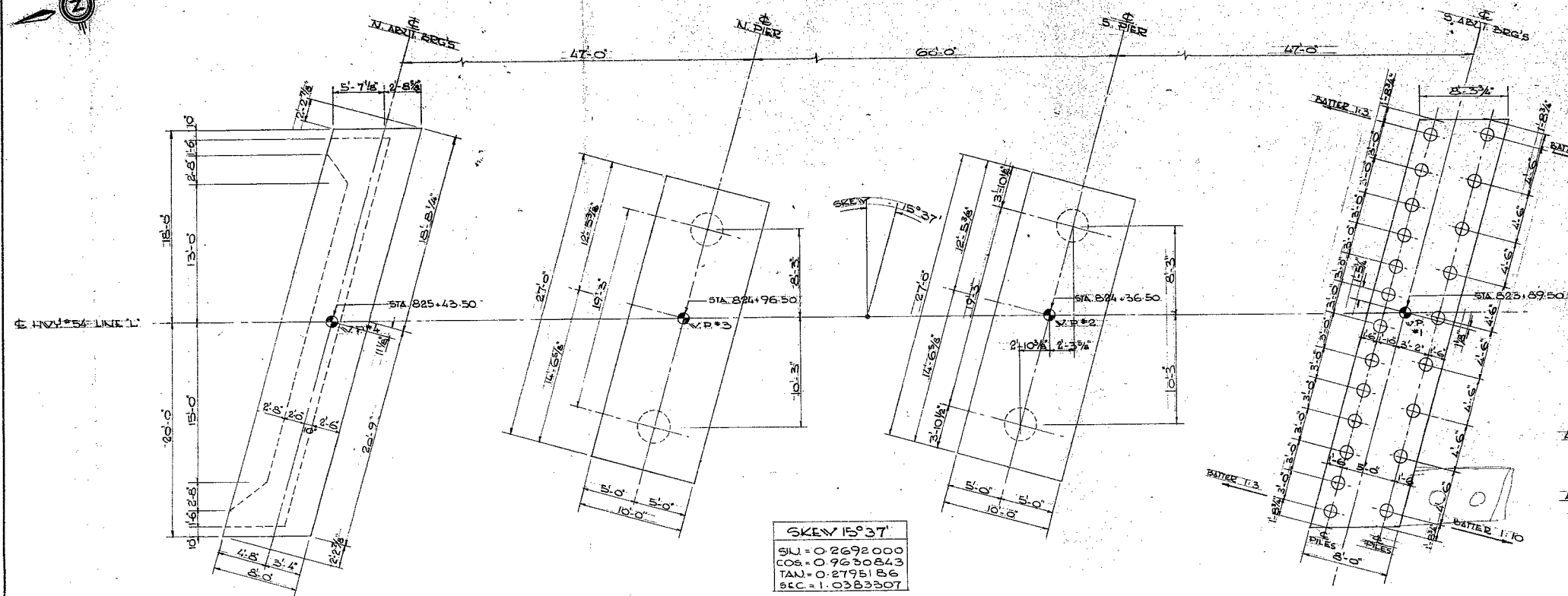
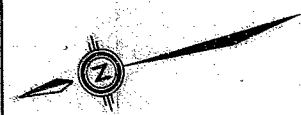
DESIGN	7.12	CHECK	K.E.H.
DRAWING	E.Δ	CHECK	13

9	DRAWING	2	6700
---	---------	---	------

DATE	AUG/70	LOADING	#1520-44
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20-44	No.	D-6720-
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[illegible]

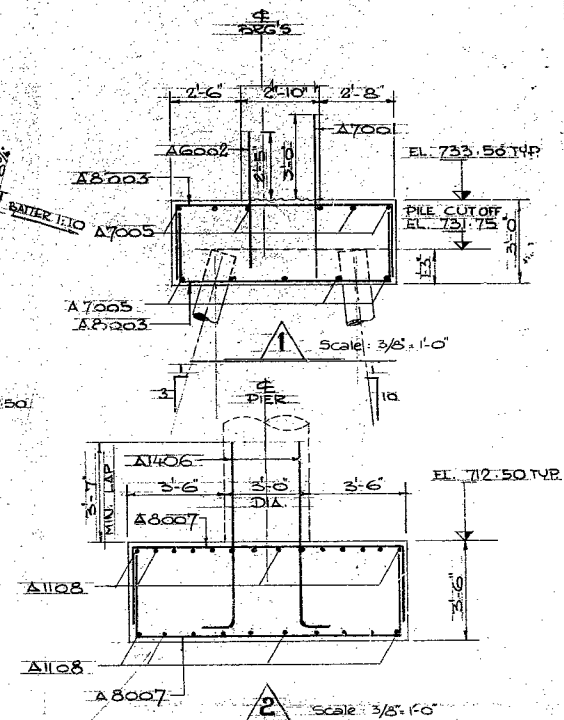


SKWY 15°37'
SIN = 0.2692000
COS = 0.9630843
TAN = 0.2795186
SEC = 1.0383307

FOUNDATION LAYOUT & PLAN

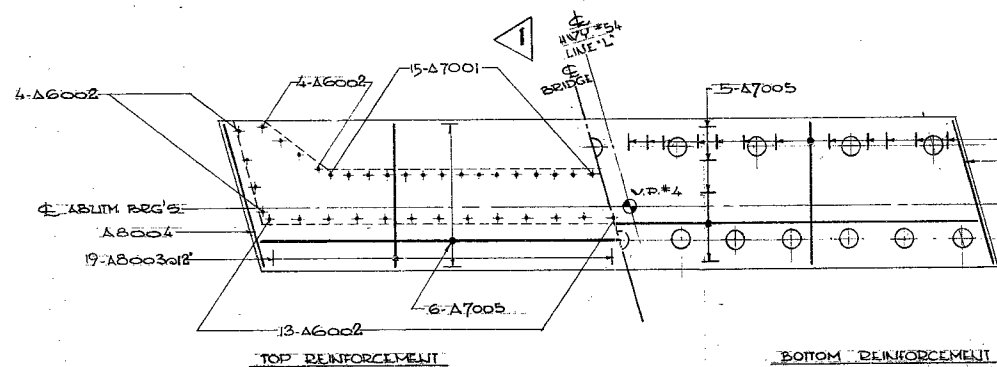
Scale: 3/16" = 1'-0"

NOTE: SPACING OF PILES MEASURED AT UNDERSIDE OF FOOTINGS.



PILES SUPPLIED

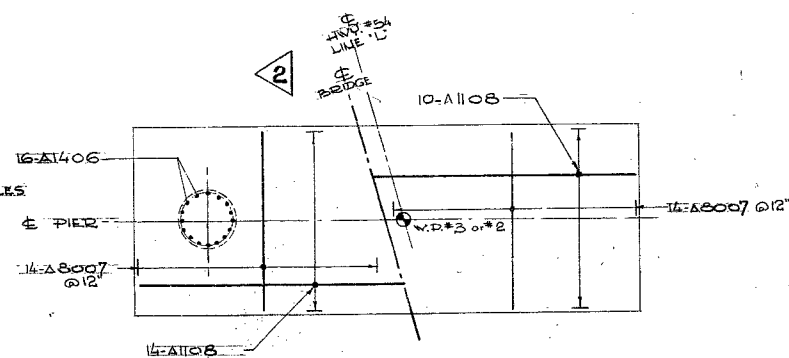
LOCATION	N. ABUTMENT	N. PIER	S. PIER	S. ABUTMENT
N°	22	—	—	22
LENGTH (EACH)	45	—	—	45
BATTER	AS SHOWN	—	—	AS SHOWN
TYPE	CREOSOTED TIMBER PILES #14			
NOTE	PILES TO BE DRIVEN TO ELEVATION 690.00			



TYP. ABUTMENT FOOTING

(SHOWING NORTH ABUTMENT FOOTING, SOUTH ABUTMENT FOOTING SIMILAR BY ROTATION.)

Scale: 1/4" = 1'-0"



TYP. PIER FOOTING

Scale: 1/4" = 1'-0"

REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

69-4-25-

C.N.R. OVERHEAD

0.2 MILES SOUTH OF HWY #2

KING'S HWY No. 54 DIST. No. 4
CO. BRANT MILE 71.75 DUNNVILLE SUBDIV'N
TWP. ONONDAGA LOT 1 CON. III & F.C.

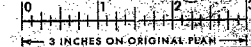
FOOTING LAYOUT

APPROVED	DATE	BY	DESCRIPTION



FOR REDUCED PLAN

USE SCALE BELOW



DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

TO: Mr. B. R. Davis,
Bridge Engineer,
Bridge Office,
Admin. Bldg.

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

ATTENTION: Mr. S. McCombie

DATE: August 12, 1969

OUR FILE REF.

IN REPLY TO 1000 1000

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at C.N.R. & Hwy. 54
Proposed Revision Line 'L'
Township of Onondaga - County of Brant
District No. 4 (Hamilton)
W.J. 69-F-25 -- W.P. 310-66

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

We believe that the factual data and recommendations contained therein, will prove adequate for your design requirements. Should additional information be required, please do not hesitate to contact our Office.

AGS/WdeF
Attach.

A. G. Sternac
A. G. Sternac
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
G. K. Hunter (2)
H. Greenland
W. S. Melinyshyn
T. J. Kovich
B. A. Singh

Foundations Files
Gen. Files

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 2. DESCRIPTION OF THE SITE AND GEOLOGY.
 3. FIELD AND LABORATORY WORK.
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 - 4.3) Bedrock.
 5. GROUNDWATER CONDITIONS.
 6. DISCUSSION AND RECOMMENDATIONS:
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 - 6.2) Structure Foundations.
 - 6.3) Approaches and Backfill.
 7. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at C.N.R. & Hwy. 54
Proposed Revision Line 'L'
Township of Onondaga - County of Brant
District No. 4 (Hamilton)
W.J. 69-F-25 -- W.P. 310-66

1. INTRODUCTION:

The Foundation Section was requested to carry out a subsurface investigation at the site of the above proposed crossing. The request was contained in a memo from the Bridge Office (Mr. W. S. Melinshyn, Regional Bridge Location Engineer) dated March 24, 1969. Subsequently, an investigation was carried out by this Section to determine the subsoil conditions at the site. This report contains the results of this investigation as well as our recommendations for the design of structure foundations and the stability of the approach fills.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site is located about 0.6 miles southeast of the existing junction of Hwys. 2 and 54 near the Community of Cainsville, in the Twp. of Onondaga, Brant County. At this location the single track of the C.N.R. traverses in an east-west direction across fairly level terrain.

Physiographically, the site is located in the "Norfolk Sand Plain" physiographic region, which, east of Brantford, consists of an extensive plain underlain by lake clay and silt deposits and broken occasionally by small drumlins. These lake deposits are believed to have been derived from Glacial Lakes Whittlesey and Warren. The area is underlain by crystalline dolomite of the Lockport formation, Silurian Period.

3. FIELD AND LABORATORY WORK:

Four boreholes, with accompanying dynamic cone penetration tests, were put down at the site by means of a standard diamond drill rig adapted for soil sampling purposes. Soil samples were obtained at the required depths by means of a 2-inch O.D. split-spoon sampler which was hammered into the soil in accordance with the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests. Relatively undisturbed soil samples were obtained from the cohesive portions of the overburden by manually pushing 2-inch I.D. Shelby tubes. Where possible, in-situ vane tests were also carried out in the cohesive material to obtain the undrained shear strengths. Bedrock was core-drilled in AXT size at two boreholes and proven for 4 to 5 ft.

The locations and elevations of the boreholes, surveyed by Foundation Section personnel, are shown on Drawing 69-P-25A, together with two estimated stratigraphical sections.

All samples were subjected to careful visual examination in the field and subsequently in the laboratory. Following this examination, various tests were carried out on selected samples to determine the following physical properties:

- Natural Moisture Contents
- Atterberg Limits
- Bulk Densities
- Undrained Shear Strengths
- Grain-Size Distributions

The results of these tests are plotted on the individual borelog sheets and are summarized on the figures in the Appendix.

4. SUBSOIL CONDITIONS:

4.1) General:

The predominant stratum across the site is an extensive deposit of irregularly stratified, clayey silt to silty clay with occasional silt seams occurring at random. The deposit, which is 130 ft. thick, is underlain directly by sound dolomite bedrock.

4.2) Stratified Clayey Silt to Silty Clay:

Underlying a surficial cover of topsoil is a 130-ft. thick deposit of clayey silt to silty clay extending down to elevation 585. The upper 8 ft. of the deposit is desiccated and has a mottled brown-grey colour. The remainder of the deposit is generally grey-coloured with occasional brown zones.

A detailed examination of all the samples indicates that the deposit varies from a clayey silt to silty clay; generally, this variation occurs in the form of stratification. The deposit has a varved appearance, but is not considered to be a varved clay, since the "varves" seldom occur at regularly spaced or frequent intervals. Some samples were found to be homogeneous in composition, whereas other samples revealed the presence of occasional silt seams up to 6 inches in thickness. These irregular silt seams were found to be present only below the desiccated zone, within the clayey silt portions of the deposit.

The results of laboratory tests carried out to determine the physical properties of the cohesive portions of the deposit are summarized on the Figures in the Appendix and are tabulated as follows:

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.2) Stratified Clayey Silt to Silty Clay: (cont'd.) ...

	<u>Clayey Silt</u>		<u>Silty Clay</u>	
	Range	(Avg.)	Range	(Avg.)
Natural Moisture Content (W) %	20 - 28	(24)	28 - 36	(30)
Liquid Limit (W _L) %	23 - 33	(30)	35 - 41	(37)
Plastic Limit (W _p) %	17 - 20	(18)	17 - 21	(19)
<u>Overall Deposit</u>				
	Range		(Avg.)	
Bulk Density (γ) PCF	121 - 131		(125)	
Undrained Shear Strength (C _u) PSF				
Lab. Vanes	1300 - 3900		-	
Lab. Tests	1000 - 2800		-	

The Atterberg tests are plotted on the Plasticity Chart, Figure 1 in the Appendix. The results indicate the soil to vary between a clayey silt of low plasticity to silty clay of medium plasticity.

Typical grain-size distributions for the siltier portions of the deposit (clayey silt to silt) are shown on Figure 2 in the Appendix.

The variation of undrained shear strength versus elevation is shown on Figure 3. The undrained shear strength of the deposit is generally in excess of 2000 PSF above elevation 680, decreasing to in the order of 1000 PSF at about elevation 610. The sensitivity of the overall cohesive deposit was found to be about 4.

Standard Penetration Resistance 'N' values in the upper desiccated zone ranged between 20 and 37 blows/ft., averaging about 28 blows/ft. Below the desiccated zone, the 'N' values tend to

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.2) Stratified Clayey Silt to Silty Clay: (cont'd.) ...

decrease with depth from about 20 blows/ft. immediately below the zone of desiccation to 11 blows/ft. at about elevation 675. On the basis of these 'N' values and the undrained shear strength characteristics, the consistency of the lower non-desiccated portion of the deposit is considered to be stiff to very stiff. The consistency of the upper desiccated zone is generally very stiff.

4.3) Bedrock:

A crystalline dolomite bedrock was encountered at elevations 585 - 586, as proven by core crilling 4 to 5 ft. in AXF size at the locations of Boreholes 1 and 4. Based on core recoveries which exceeded 90 per cent, the bedrock is considered to be sound.

5. GROUNDWATER CONDITIONS:

Water level observations were carried out in the open boreholes upon completion of the field work. These observations are summarized on the individual borelog sheets as well as on Drawing 69-F-25A, and indicate that the groundwater level is situated at a depth of 5 to 8 ft. below the ground surface. One pumping test carried out at Borehole 3, indicated a rapid rise in the water level (37 ft. in 24 hours). It is inferred from this test that the silt seams present within the non-desiccated portion of the clayey silt to silty clay deposit, are water bearing.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct an overhead to carry Hwy. 54 (Revision Line 'L') across the C.N.R. track near the Community of Cainsville in Brant County. Present proposals call for a single-span structure with a clear span of 32.5 ft. Closed-type abutments with associated wing walls will be used to retain the 30-ft. high fills at both approaches.

The investigation has revealed the presence of a stiff to very stiff, stratified, clayey silt to silty clay deposit extending from ground surface to a depth of 130 ft. and followed by sound bedrock at elevation 585.

6.2) Structure Foundations:

The proposed structure may be supported on spread footings designed for a safe allowable bearing pressure of 2.5 TSF and located within the desiccated crust at or above elevation 712.0.

It is estimated that the maximum settlement of such footings, associated with 30-ft. high embankments, will be about 8 inches. In view of the presence of irregular silt seams and the stratified nature of the overall deposit, the time rate of settlement cannot be predicted with any reasonable accuracy. For the proposed single-span structure, with uniform loading conditions at both approaches, the settlements will, in general, be equal at each footing location. Consequently, no major differential settlement problems are anticipated.

In order to compute the resistance to sliding at the base of the footings due to the lateral earth pressures within the backfill, a value of 2000 PSF may be used for the adhesion between the footings and the subsoil.

For frost protection, an adequate thickness of soil cover should be provided above the underside of the footings.

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

6.2) Structure Foundations: (cont'd.) ...

No major dewatering problems are anticipated during construction, in view of the relatively impermeable nature of the subsoil. Any seepage into the footing excavations can be handled by ordinary pumping methods.

6.3) Approaches and Backfill:

The approach fills will be some 30 ft. in height. Such fills will be stable if constructed of well compacted fill material with standard 2:1 slopes.

The backfill behind the abutments and wing walls should consist of free-draining granular material and should be constructed as per current D.H.O. Standards. Suitable weep holes should be provided at the bases of the retaining elements in order to minimize any hydrostatic buildup within the backfill.

The total consolidation settlement, due to the induced loading from the 30-ft. high fills, will be in the order of 6 to 8 inches.

7. MISCELLANEOUS:

The field work, performed during the period May 22 - 30, 1969, was carried out by Mr. V. Korlu, Project Foundation Engineer.

Equipment used was owned and operated by Dominion Soil Investigation Ltd.

The writing of this report was undertaken by Mr. C. Mirza, Project Foundation Engineer.

General supervision of the project was under the direction of Mr. M. Devata, Supervising Foundation Engineer, who also reviewed this report.

August 1969.

APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 69-F-25

LOCATION Sta. 824+95 @ Hwy. 54 Prop. Rev'n Line 'L' o/s 30' Rt.

ORIGINATED BY VK

W.P. 310-66

BORING DATE May 22-26, 1969

COMPILED BY CM

DATUM Geodetic

BOREHOLE TYPE Washboring-NX Casing; Cone

CHECKED BY

SOIL PROFILE			SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE		20	40	60	80	100	w_p	w	w_L		
717.0	Ground Level														
0.0	Topsoil														
1.5	Desiccated Very Stiff		1	SS	21										
709.0	Mottled Grey-Brown		2	SS	20	710									709.0
8.0			3	SS	24										
	Stratified clayey silt		4	SS	20										
	to		5	SS	22	700									
	silty clay with occ.		6	SS	17										
	silt seams.		7	SS	20	690									
	Stiff to very stiff		8	SS	17										
	Grey		9	SS	13	680									
			10	SS	11										
			11	TW	PM	670								122	
			12	TW	PM	660								126	
			13	TW	PM	650									
			14	TW	PM	640								121	
			15	TW	PM	630									
			16	TW	PM	620								125	
			17	TW	PM	610									
585.0			18	AXT	92%	600									
132.0	Dolomite Bedrock Sound					590									
581.0															
136.0	End of Borehole					580									

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 69-F-25

LOCATION Sta. 825+11 @ Hwy. 54 Prop. Rev'n. Line 'L' o/s 29' Lt.

ORIGINATED BY VK

W.P. 310-66

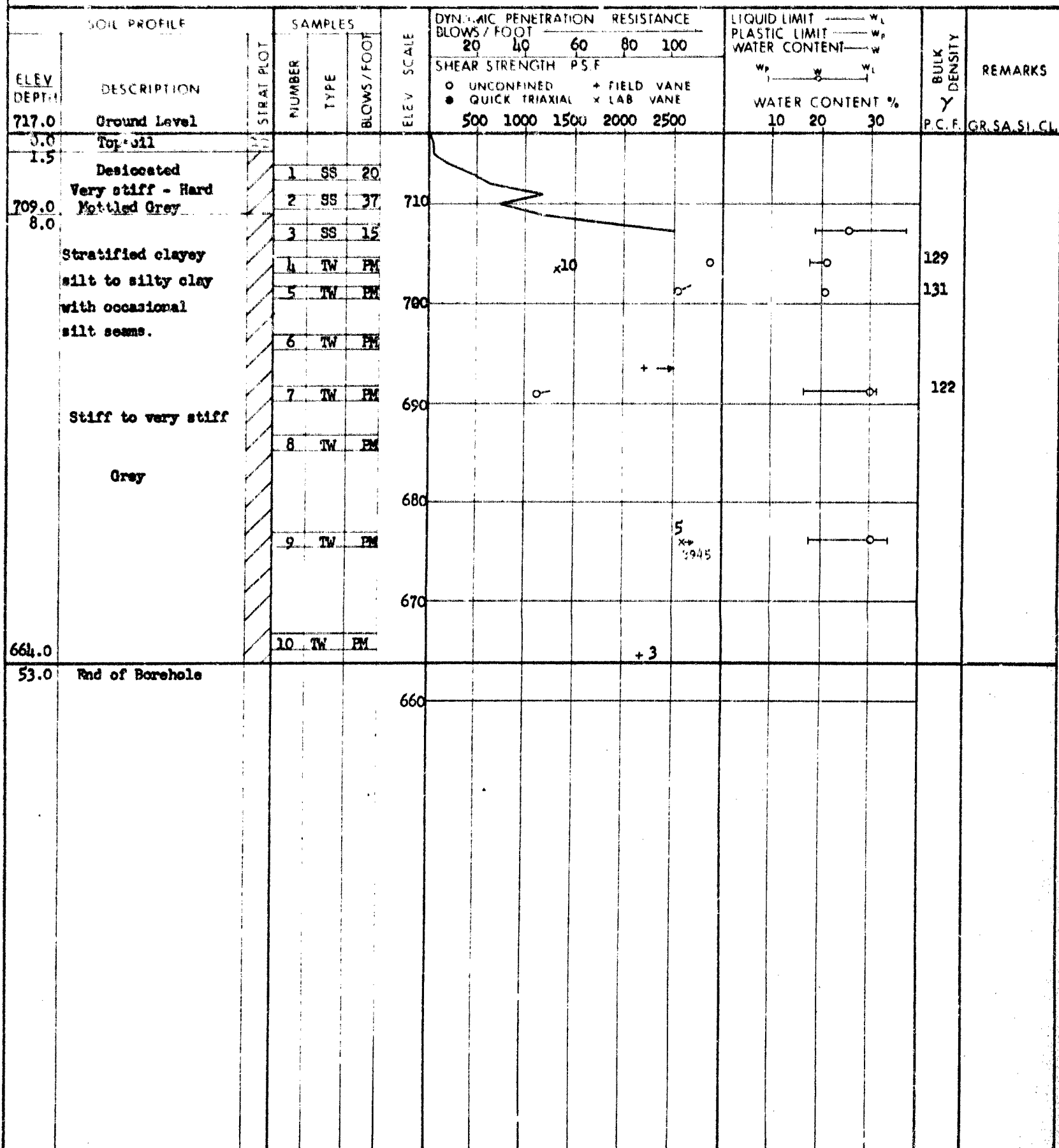
BORING DATE May 27, 1969

COMPILED BY CM

DATUM Geodetic

BOREHOLE TYPE Washboring - NX Casing; Cone

CHECKED BY



DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 69-F-25

LOCATION Sta. 824 + 18 @ Hwy. 54 Prop. Rev'n Line 'L' o/s 34' RT

ORIGINATED BY

VK

W.P. 310-66

BORING DATE May 28, 1969

COMPILED BY

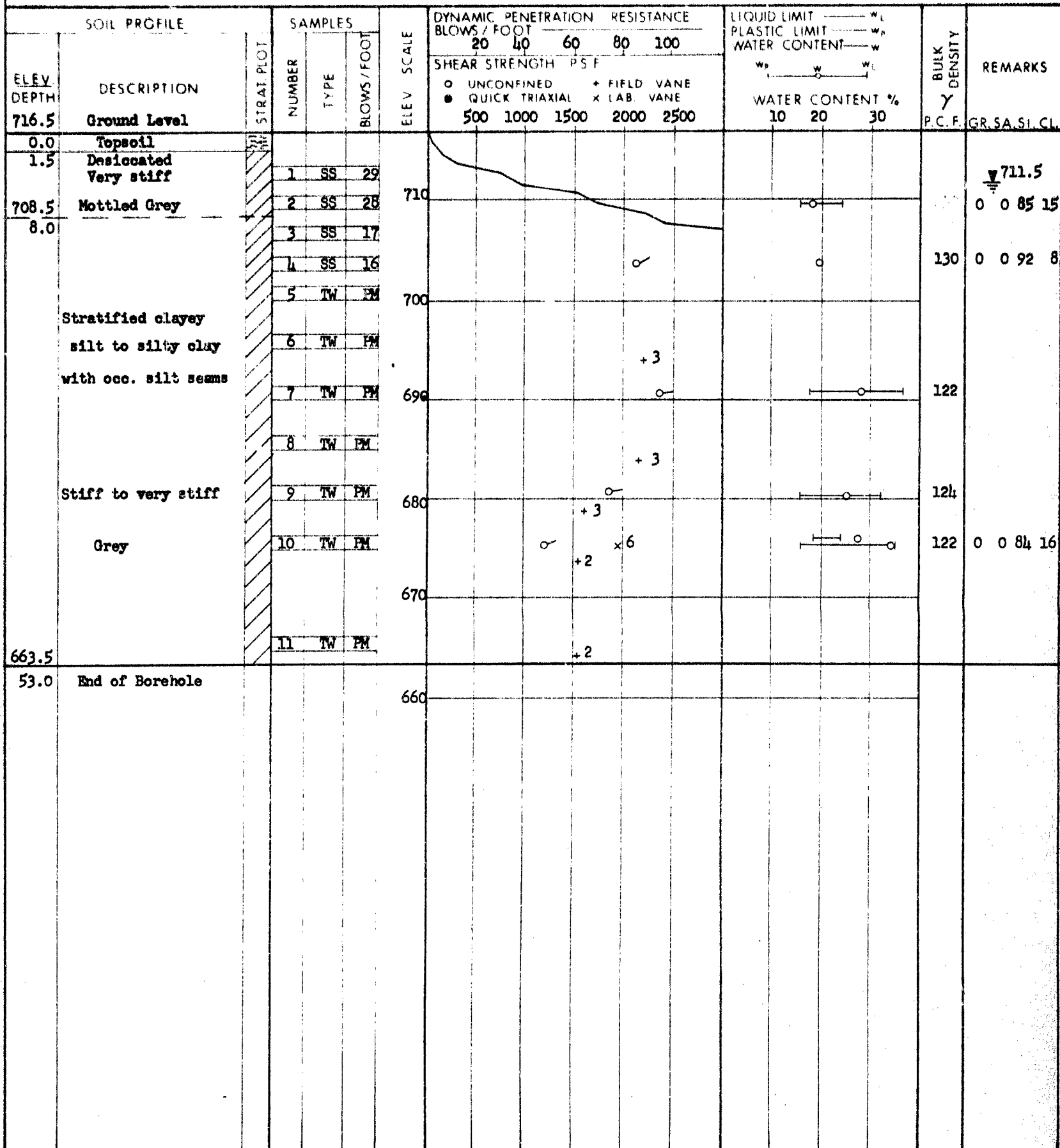
CM

DATUM Geodetic

BOREHOLE TYPE Washboring - NX Casing; Cone

CHECKED BY

VK



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 69-F-25

LOCATION Sta. 824+37 @ Hwy. 54 Prop. Rev'n Line 'L' o/s 31' Lt.

ORIGINATED BY VK

W.P. 310-66

BORING DATE May 29 - 30, 1969

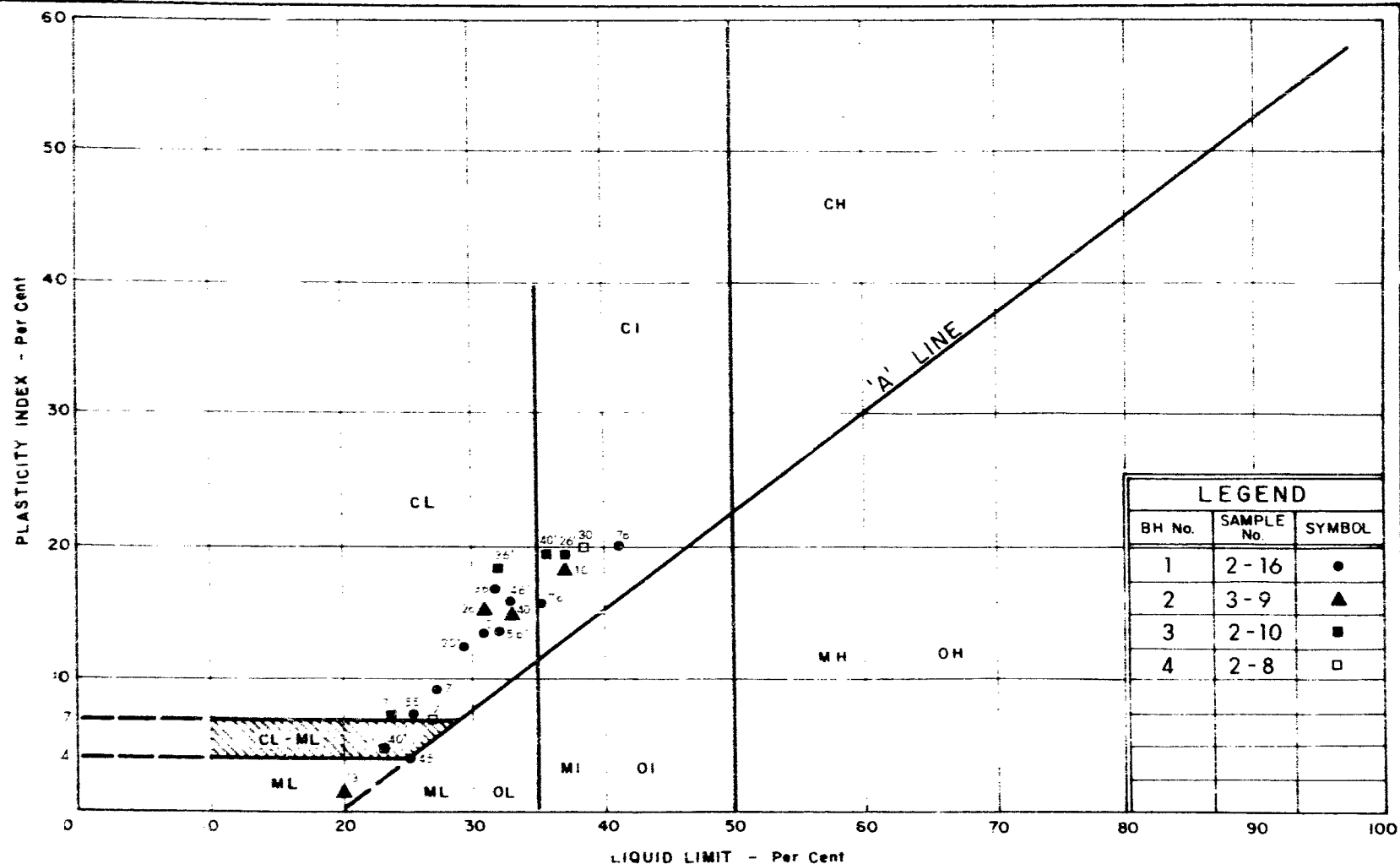
COMPILED BY CM

DATUM Geodetic

BOREHOLE TYPE Washboring-NX Casing; Cone

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT PLASTIC LIMIT WATER CONTENT			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		20	40	60	80	100	W _p	W _L	W _U		
716.0	Ground Level					SHEAR STRENGTH P S F					WATER CONTENT %				
0.0	Topsoil					○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					10 20 30				
1.5	Desiccated Very stiff		1	SS	26										
708.0	Mottled Brown-Grey		2	SS	19										
8.0			3	SS	16										
			4	TW	PM	x		9						126	
			5	TW	PM				+						
	Stratified clayey silt to silty clay		6	TW	PM										
	with occasional silt seams		7	TW	PM				+ 2						
			8	TW	PM				+					121	
			9	TW	PM				+ 2						
	Stiff to very stiff		10	TW	PM				+ 2						
			11	TW	PM				+ 3						
			12	TW	PM			x	+ 2						
	Grey														
			13	TW	PM									123	0 0 89 11
			14	TW	PM										
			15	TW	PM										Lost
586.0															
130.0	Dolomite Bedrock Sound		16	AXT	98%										
581.0															
135.0	End of Borehole														



PLASTICITY CHART
CLAYEY SILT TO SILTY CLAY

WP No. 310 - 66

JOB No. 69-F-25

FIGURE 1



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY & SILT

SAND

GRAVEL

Fine

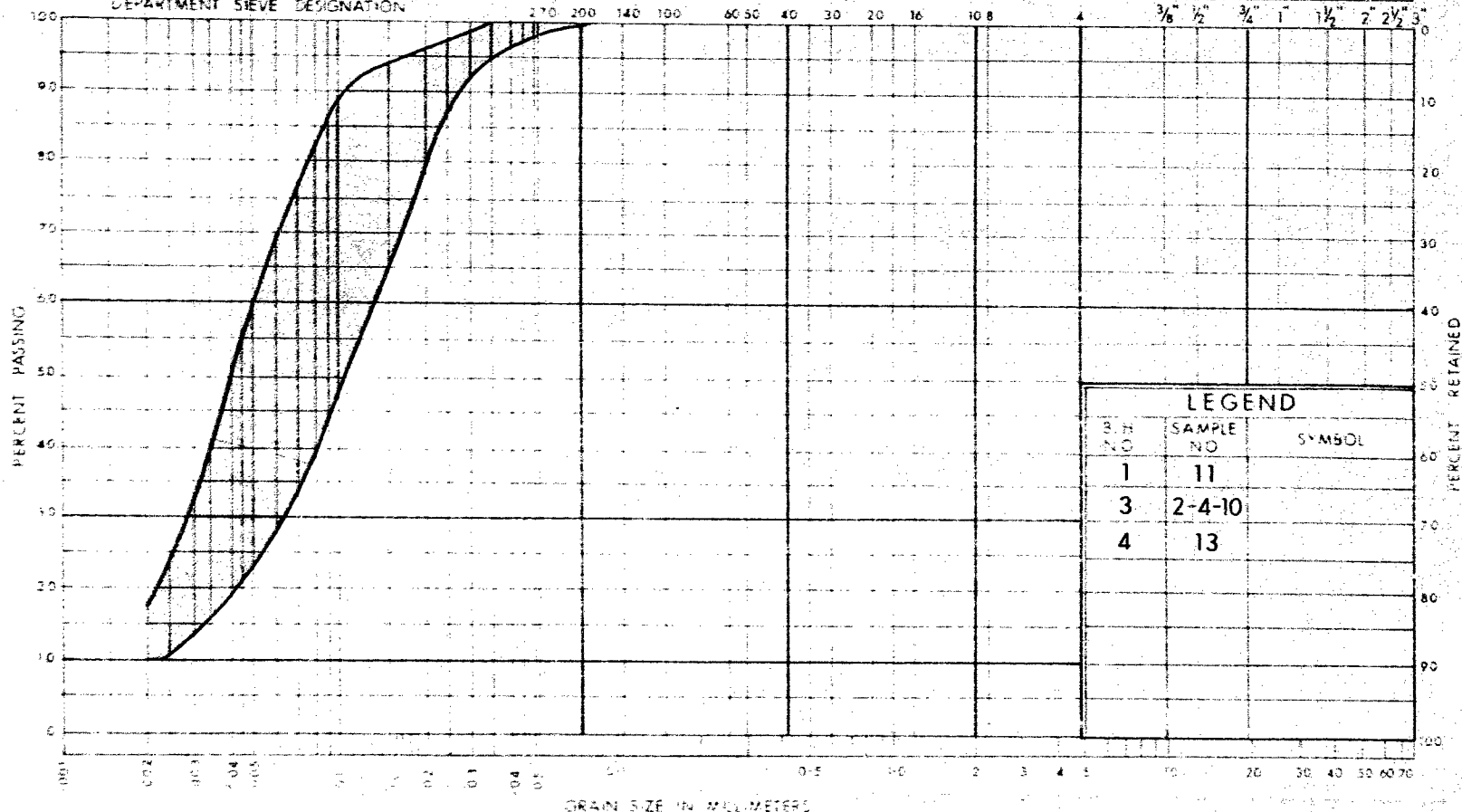
Medium

Coarse

Fine

Coarse

DEPARTMENT SIEVE DESIGNATION



LEGEND

S. NO.	SAMPLE NO.	SYMBOL
1	11	
3	2-4-10	
4	13	



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

GRAIN SIZE DISTRIBUTION
SILT TO CLAYEY SILT

WP No. 310-66

JOB No. 69-F-25

FIGURE 2

UNDRAINED SHEAR STRENGTH VS DEPTH

CLAYEY SILT TO SILTY CLAY

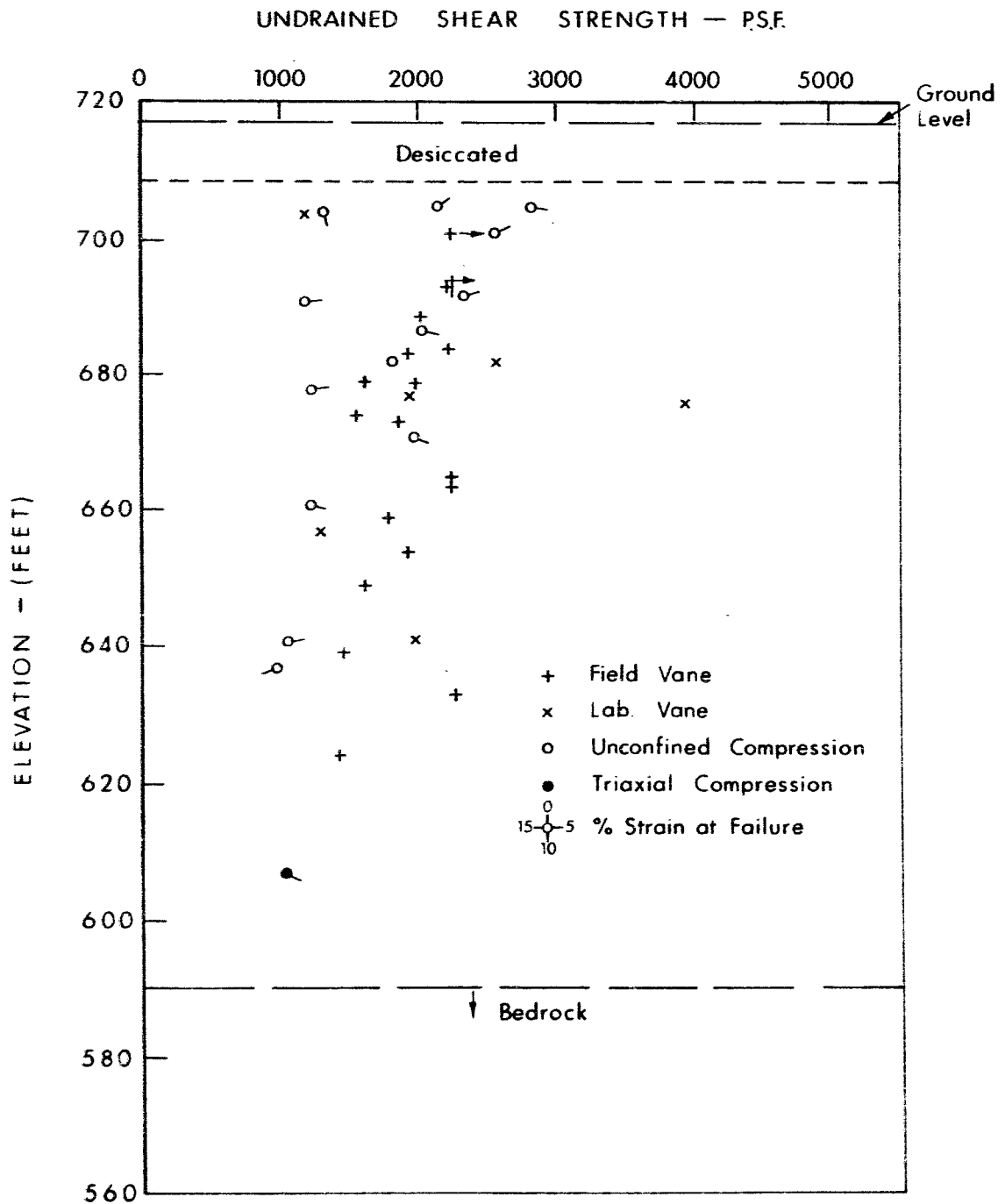


FIG. 3

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

SS	SPLIT SPOON	TW	THINWALL OPEN
WS	WASHED SAMPLE	TP	THINWALL PISTON
SB	SCRAPER BUCKET SAMPLE	OS	OESTERBERG SAMPLE
AS	AUGER SAMPLE	FS	FOIL SAMPLE
CS	CHUNK SAMPLE	RC	ROCK CORE
ST	SLOTTED TUBE SAMPLE		
	PH SAMPLE ADVANCED HYDRAULICALLY		
	PM SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Qu	UNCONFINED COMPRESSION	LV	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	FV	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_v	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_c	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	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	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
$\bar{\sigma}$	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

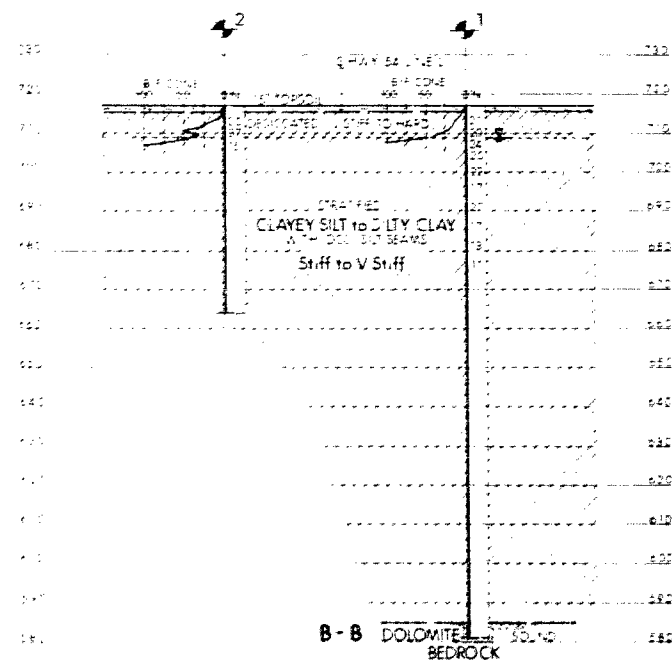
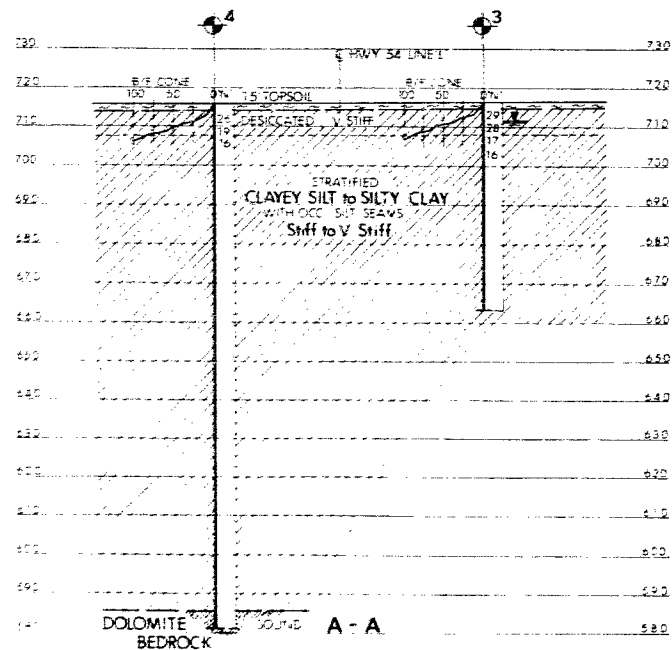
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

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

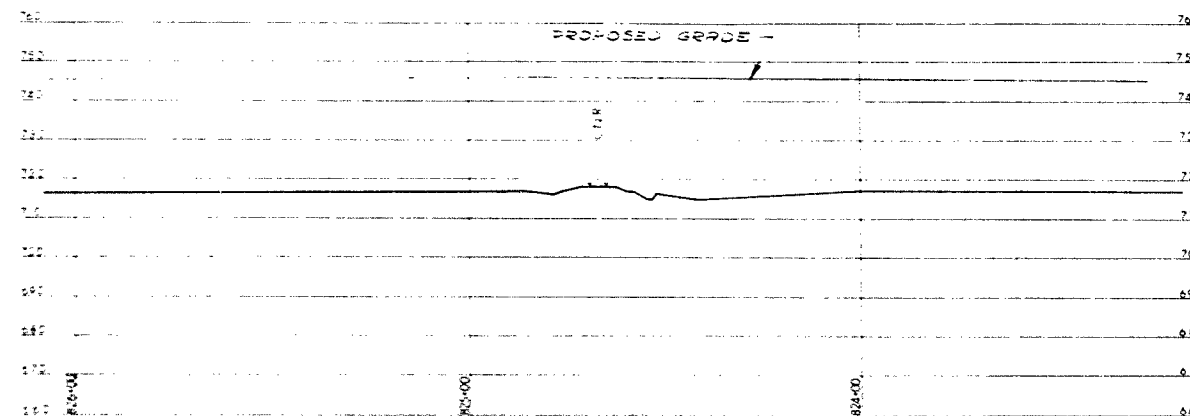
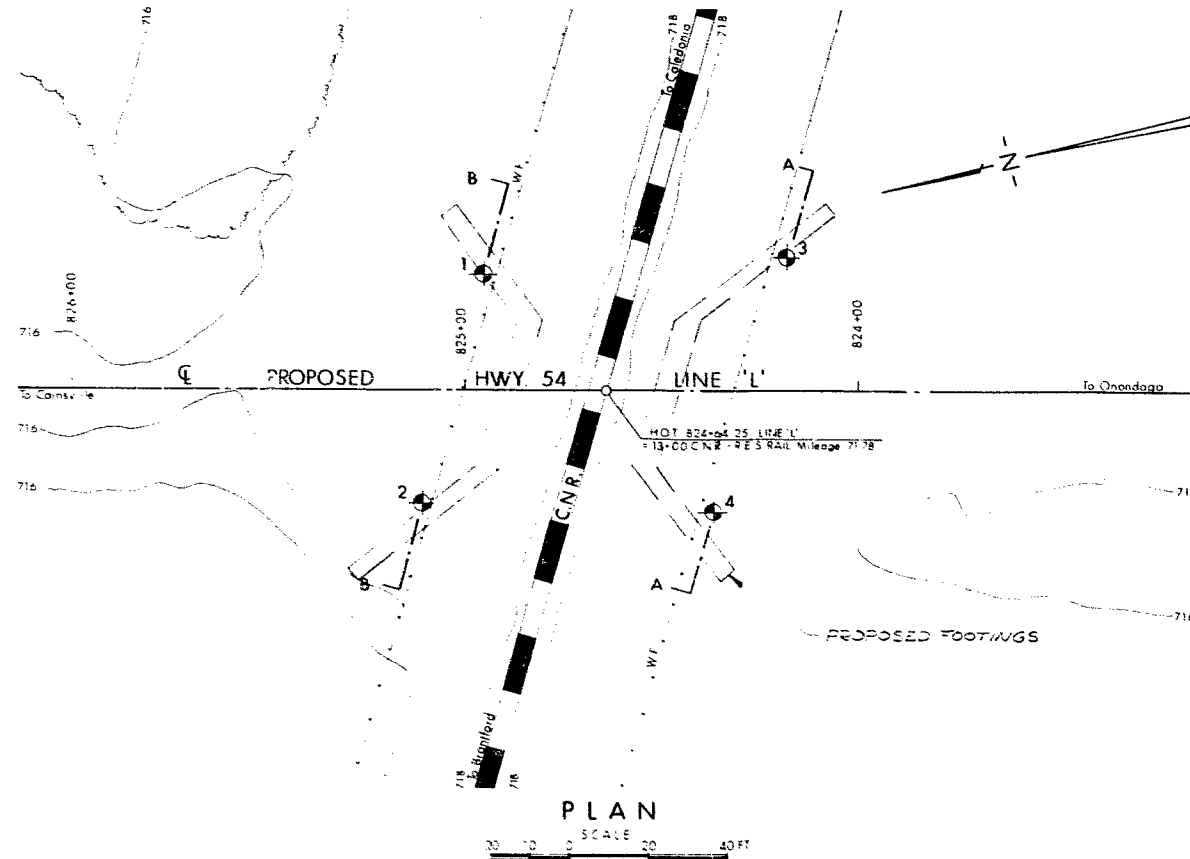
SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL



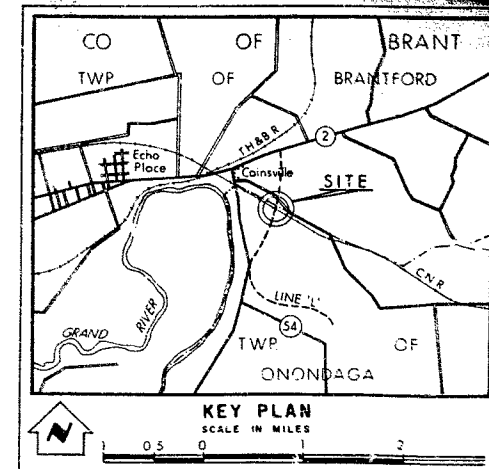
SECTIONS

20 10 0 10 20 40 FT



Q PROFILE

20 10 0 10 20 40 FT



LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water levels established at time of field investigation, MAY 1969

NO.	ELEVATION	STATION	OFFSET
1	717.0	824+95	30' RT
2	717.0	825+11	29' LT
3	716.5	824+18	34' RT
4	716.0	824+37	31' LT

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.

DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE - FOUNDATION SECTION

CANADIAN NATIONAL RAILWAY

KING'S HIGHWAY NO. 54 LINE 'L' DIST. NO. 4
CO. BRANT
TWP. ONONDAGA LOT CON.

BORE HOLE LOCATION & SOIL STRATA

SUBMIT V.K.	CHECKED	WP NO. 310-66	W.S.T. DRAWING NO.
DRAWN S.O.	CHECKED	JOB NO. 69-F-25	69-F-25A
DATE 11 AUG 1969	SITE NO.	BRIDGE DRAWING NO.	
APPROVED	CONT NO.		

64-6-25 M Devata
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

To: Watone Lin
Regional Structure Design Engineer
Structural Office
West Building

ATTENTION:

FROM: R. G. Burnfield
Regional Highway Design Engineer
Regional Systems Design Office

DATE: September 29, 1972

OUR FILE REF.

IN REPLY TO

SUBJECT: W. P. 310-66 and No. 202-63-01, Highway 54
C. N. R. Overhead Site 1-165
District No. 4, Hamilton, Ontario

Further to your memo of September 14, 1972, we will insert in the contract a special provision stating that the contractor will build the approach fills as one of the first operations on the contract and allow a minimum of 6 months before starting construction on the bridge.

This should not cause any great inconvenience to the contractor as the quantity of earth borrow is sufficient for the approaches and the remainder of the grading is almost balanced.



E. A. Fletcher

RGB/EAF/es
C. C.
C. R. Robertson
M. Devata
G. Burkhardt

FOR: R. G. Burnfield
Regional Highway Design Engineer



DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

Copy for the information of M. Devata

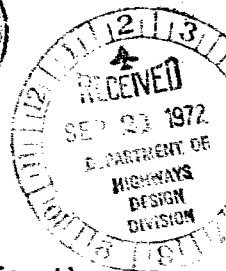
Mr. C. C. E. Burkhardt

Regional Structural Planning Engineer,
3501 Dufferin Street, DOWNSVIEW.

4-222
W. Lin,
Structural Office,
West Building, DOWNSVIEW.

September 14, 1972
SEP 14 1972

C.N.R. Overhead
W.P. #310-66, Site #1-165,
Hwy. #54, District #4.



Please find attached two sets of revised prints for the above structure.

With reference to the comments on the structure drawings by the C.N.R., the following action has been taken.

There is not enough data available to establish the railway profile. However, the top-of-rail elevations are added on the plan.

The profile grade elevation at P.I. station 824+70 has been updated to 754.03.

The dowels at the back face of the abutments have been changed from straight bars to "I" shape bars.

We have discussed the possibility of differential settlement in substructures with our foundation section. They recommended that the approach fill at both ends of the bridge be constructed six months or more prior to the construction of the bridge. This will minimize the additional force induced on timber piles due to the fill.

please
note

WL:dp
Encl.

Watone Lin,
Regional Structural
Design Engineer.

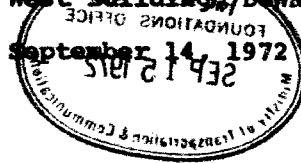
cc. M. Devata. ✓

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

Copy for the information of M DEVATA

~~Mr. G. C. E. Burkhardt,~~
Regional Structural Planning Engineer,
3501 Dufferin Street, DOWNSVIEW.

W. Lin,
Structural Office,
West Building, DOWNSVIEW.



C.N.R. Overhead
W.P. #310-66, Site #1-165,
Hwy. #54, District #4.

Please find attached two sets of revised prints for the above structure.

With reference to the comments on the structure drawings by the C.N.R., the following action has been taken.

There is not enough data available to establish the railway profile. However, the top-of-rail elevations are added on the plan.

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WL:dp
Encl.

Watone Lin,
Regional Structural
Design Engineer.

cc. M. Devata. ✓

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundation Engineer,
West Building.

FROM: G. C. E. Burkhardt,
Structural Planning Office,
90 Floral Parkway.

ATTENTION:

DATE: August 23, 1972.

OUR FILE REF.

IN REPLY TO

SUBJECT: Proposed Overhead at C.N.R.
New Highway 54,
Site 1-165, W.P. 310-66,
District 4, Hamilton.

69-F-25

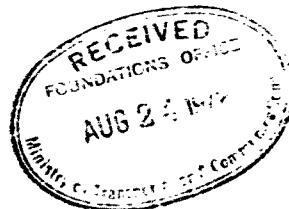
Attached is a copy of the C.N.R. letter dated August 3, 1972.

Would you please send us your comments on the settlement problem outlined in that letter.

MAA:lc
Attach.

M. A. Almer, *M. A. Almer*
STRUCTURAL PLANNING ENGINEER,
for:
G. C. E. Burkhardt,
REG. STRUCTURAL PLANNING ENG.

c.c. H. Smith



CN
Canadian National Railways
Great Lakes Region

Room 257, Union Station
Toronto 116, Ontario

3 August 1972

Our file: 1600-DV-71.78

Your file: WP 310-66,
Site 4-222

Mr. R. G. Burnfield, P.Eng.
Regional Highway Design Engineer
Department of Transportation and Communications
Central Region
Downsview, Ontario

Attention: Mr. R. Smith, P. Eng.

Re: Proposed Overhead Bridge on Highway 54, Cainsville, Ontario Mile 71.78
Dunnville Subdivision.

Gentlemen:

Please refer to your application to the Railway Transport Committee dated 14 July 1972 dealing with this proposed structure.

We are examining the set of plans D6720-1 through-10 sent to our Regional Engineer, Mr. J. J. Manamaker and wish to bring the following to your attention.

Although not required by the requirements of Board Order E-5, it has been your custom to include a profile of track at a bridge location along with the profile of the proposed roadway. Please arrange to show the profile on Drawing D-6720-1, and also verify that elevation of profile grades at P.I. Station 824 + 70 is to be EL. 754.03, not EL 753.95.

We are additionally concerned about the dowelling detail of bars A 6002 and A7001 in the abutments. No doubt the length of embedment satisfies required bond, but we have found that bars so detailed are difficult to tie and prefer to see a detail where the bottom of bars is bent to enable tying to the bottom layer of re-bars, as in your detail for the No. 14 bars in the piers.

...2

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

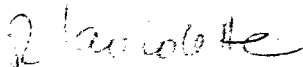
The bent bar detail also precludes the opportunity of dowels being placed after concrete is poured but not quite set.

The nature of the sub-soil appears to be a saturated clay-silt combination which at times can present difficult to handle differential settlement problems. Since the deck of this structure is to be poured to provide continuity for live load, please confirm that the differential settlement possibilities have been investigated and that you are satisfied that the structure will satisfy these conditions.

We will withhold the Railway's comments to the Board until hearing from you. Please arrange to send any drawing revisions to the Board in addition to copies to us. You may wish to make note that our mailing address has been changed and that future correspondence to this office should be addressed to

Mr. W. J. Manamak P.Eng.
Regional Engineer
Canadian National Railways
R.R.C. Box 112
Union Station
Toronto 116, Ontario

Yours truly,



J. Jeronimus, P.Eng.
Bridges and Structures Engineer

MEMORANDUM

69-F-25

To: Mr. A.G. Stermac,
Principal Foundation Eng.,
Room 107,
Lab. Building.

FROM: W.S. Melinyshyn,
Bridge Office.

ATTENTION:

DATE: March 24th, 1969.

OUR FILE REF.

IN REPLY TO

SUBJECT: C.N.R. Overhead,
W.P. 310-66, Site 1-165,
0.2 Miles South of Hwy. 2,
Hwy. 54, District No. 4.

Herewith are two prints of the Bridge Site Plan E-4911-1, on which the probable location of footings have been marked in red.

Please arrange for a foundation investigation of sufficient scope to enable us to proceed with the design.

Also attached is the field reconnaissance report and a print of plan G-2985 to enable you to locate the structure site and access thereto.

J.F. Walshe

JFW/cew
Attach.

cc E. Cross

J.F. Walshe,
BRIDGE LOCATION SUPERVISOR,
for:
W.S. Melinyshyn,
REGIONAL BRIDGE LOCATION ENGINEER.

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 76-15 STRUCTURE W.P. NO. CNR OVERHEAD
CONTRACTOR CAMPBELL (WESTERN PILE) DESIGN LOAD OF PILE 15 TON DRIVEN TO 705.00
HAMMER DETAILS: TYPE Demag D-12 WEIGHT 1.38 T HEIGHT OF FALL OR ENERGY
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP .25 T
PILE DETAILS CORROSED TUBER PILE 14 LENGTH 45' BATTER: 1-3
PILE NO. 25 LOCATION N. AVE. ETC DATE DRIVEN SEP 15/76

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
45'	1	—		26	104		51			76	
	2	1		27	98		52			77	
	3	1		28	111		53			78	
	4	1		29			54			79	
	5	4		30			55			80	
	6	6		31			56			81	
	7	6		32			57			82	
	8	7		33			58			83	
	9	11		34			59			84	
	10	17		35			60			85	
	11	19		36			61			86	
	12	24		37			62			87	
	13	31		38			63			88	
	14	29		39			64			89	
	15	22		40			65			90	
	16	16		41			66			91	
	17	22		42			67			92	
	18	25		43			68			93	
	19	20		44			69			94	
	20	23		45			70			95	
	21	23		46			71			96	
	22	33		47			72			97	
	23	36		48			73			98	
	24	114		49						99	
	25	96		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	8					
MEASURED REBOUND IN INCHES	3/8					
FINAL LENGTH OF PILE	27'6"					FINAL CUT OFF ELEVATION 731.75

REPORT TO BE SENT TO: -

GEOTECHNICAL OFFICE
ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
DOWNSVIEW, ONTARIO

SIGNED S. Sturgeon
NAME (PRINT) S. STURGEON
DATE SEP 15/76
ATTACH SKETCH OF PILE NUMBERING SYSTEM

NOTES:

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 3/4" O.D. steel tube x 0.251" @ 33 lbs. per foot vertical. 12 3/4" x 1/2" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 76-15 STRUCTURE W.P. NO. CNP OVERHEAD
CONTRACTOR CAMPBELL CONST. (WESTERN PILE) DESIGN LOAD OF PILE 15 TON (DRIVEN 69)
HAMMER DETAILS: TYPE DENHAM D-17 WEIGHT 1.38 T HEIGHT OF FALL OR ENERGY _____
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP .25 T
PILE DETAILS TAPER PILE #14 GALVANIZED 45' LONG BATTER: 1-10
PILE NO. 36 LOCATION NEAR ABUTMENT CNP OVERHEAD DATE DRIVEN SEPT 14/76

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
45'	1	1		26	30		51			76	
	2	1		27	32		52			77	
	3	1		28	32		53			78	
	4	1		29	65		54			79	
	5	2		30	71		55			80	
	6	4		31	75		56			81	
	7	5		32	76		57			82	
	8	4		33	68		58			83	
	9	5		34	56		59			84	
	10	9		35	47		60			85	
	11	9		36	50		61			86	
	12	10		37	47		62			87	
	13	9		38	54		63			88	
	14	10		39	57		64			89	
	15	17		40			65			90	
	16	13		41			66			91	
	17	15		42			67			92	
	18	18		43			68			93	
	19	20		44			69			94	
	20	25		45			70			95	
	21	35		46			71			96	
	22	31		47			72			97	
	23	35		48			73			98	
	24	32		49			74			99	
	25	28		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5
BLOWS PER INCH	5				
MEASURED REBOUND IN INCHES	3/8				
FINAL LENGTH OF PILE <u>39'2"</u>	FINAL CUT OFF ELEVATION <u>731.75</u>				

REPORT TO BE SENT TO:

GEOTECHNICAL OFFICE
ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
DOWNSVIEW, ONTARIO

SIGNED B. J. Huggins
NAME (PRINT) B. J. HUGGINS
DATE SEP 16/76
ATTACH SKETCH OF PILE NUMBERING SYSTEM

NOTES:

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 3/4" O.D. steel tube x 0.251" @ 33 lbs. per foot vertical. 12 3/4" x 1/2" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 76-15 STRUCTURE W.P. NO. CNR OVERHEAD
CONTRACTOR CAMPBELL (WESTERN) PILE DESIGN LOAD OF PILE 15 TON
HAMMER DETAILS: TYPE DELMAG D-17 WEIGHT 1.38 T HEIGHT OF FALL OR ENERGY _____
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP .25 T
PILE DETAILS CRUSHED TIMBER PILE 14" LENGTH 45' BATTER: VERTICAL
PILE NO. 3 LOCATION SABUT. ETC. DATE DRIVEN SEP 21/76

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
45	1	-	26	37		51			76		
	2	-	27	40		52			77		
	3	-	28	47		53			78		
	4	1	29	63		54			79		
	5	1	30	72		55			80		
	6	2	31	74		56			81		
	7	3	32			57			82		
	8	3	33			58			83		
	9	3	34			59			84		
	10	4	35			60			85		
	11	6	36			61			86		
	12	11	37			62			87		
	13	10	38			63			88		
	14	7	39			64			89		
	15	9	40			65			90		
	16	10	41			66			91		
	17	11	42			67			92		
	18	14	43			68			93		
	19	18	44			69			94		
	20	35	45			70			95		
	21	40	46			71			96		
	22	35	47			72			97		
	23	34	48			73			98		
	24	39	49			74			99		
	25	40	50			75			100		

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	6					
MEASURED REBOUND IN INCHES	1/2					
FINAL LENGTH OF PILE <u>32'</u>	FINAL CUT OFF ELEVATION <u>731.75</u>					

REPORT TO BE SENT TO: -

GEOTECHNICAL OFFICE
ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
DOWNSVIEW, ONTARIO

SIGNED [Signature]
NAME (PRINT) JOHN CAMPBELL
DATE SEP 21/76
ATTACH SKETCH OF PILE NUMBERING SYSTEM.

NOTES:

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

File Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 3/4" O.D. steel tube x 0.251" @ 33 lbs. per foot vertical. 12 3/4" x 1/2" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 76-15 STRUCTURE W.P. NO. CALR. OVERHEAD
CONTRACTOR CAMPBELL (WESTERN) PILE DESIGN LOAD OF PILE _____
HAMMER DETAILS: TYPE DELTA D-12 WEIGHT 1385 HEIGHT OF FALL OR ENERGY _____
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP .25-7
PILE DETAILS (Pile) Timber Piles 14 LENGTH 45' BATTER: 1-3
PILE NO. 32 LOCATION SOUTH ABUT. FTG. DATE DRIVEN Sept 23/76

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
	1	—		26	40		51			76	
	2	—		27	49		52			77	
	3	—		28	57		53			78	
	4	1		29	61		54			79	
	5	1		30	68		55			80	
	6	1		31	86		56			81	
	7	3		32			57			82	
	8	5		33			58			83	
	9	5		34			59			84	
	10	4		35			60			85	
	11	7		36			61			86	
	12	13		37			62			87	
	13	19		38			63			88	
	14	21		39			64			89	
	15	22		40			65			90	
	16	21		41			66			91	
	17	18		42			67			92	
	18	16		43			68			93	
	19	20		44			69			94	
	20	26		45			70			95	
	21	33		46			71			96	
	22	34		47			72			97	
	23	43		48			73			98	
	24	53		49			74			99	
	25	35		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	5					
MEASURED REBOUND IN INCHES	1/2					
FINAL LENGTH OF PILE <u>32'-2"</u>	FINAL CUT OFF ELEVATION <u>731.75'</u>					

REPORT TO BE SENT TO:-

GEOTECHNICAL OFFICE
ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
DOWNSVIEW, ONTARIO

SIGNED [Signature]
NAME (PRINT) G. STURGEON
DATE Sept 23/76
ATTACH SKETCH OF PILE NUMBERING SYSTEM

NOTES:

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 3/4" O.D. steel tube x 0.251" @ 33 lbs. per foot vertical. 12 3/4" x 1/2" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to rock. Final length of pile, and final cut off elevation must always be given.

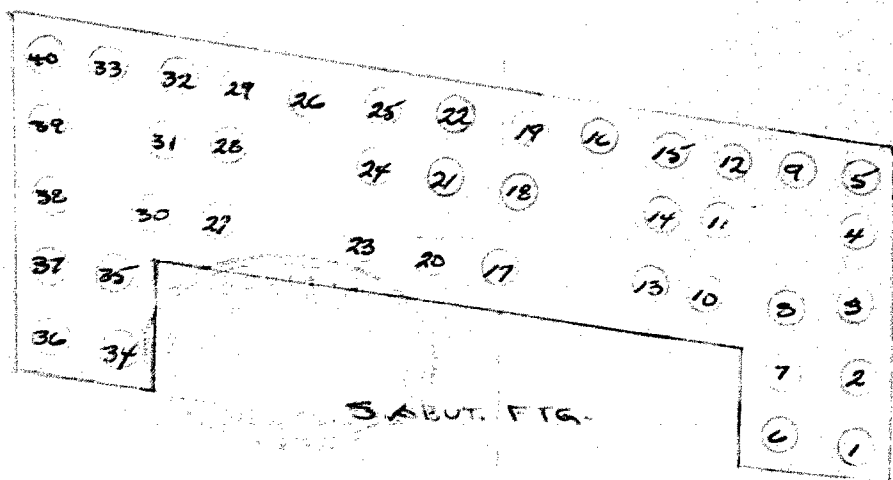
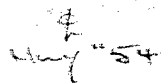
The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.



TIMBER FIRE LOGS





Memorandum

ms

To: Mr. G. Burkhardt,
Structural Planning Office,
3501 Dufferin Street,
Downsview, Ontario.

From: Structural Office,
West Building,
Downsview, Ontario.

Attention:

Date: May 30, 1975.

Our File Ref.

In Reply to

Subject:

Approach Fill for
W.P. 310-66, Site 1-165
CNR Overhead
Hwy. #54, District #4

The question of differential settlement of substructures was raised during the recent contract review for the above project. A discussion with the Soil Mechanics Section confirms that their previous recommendation of placing approach fill six months or more prior to the construction of the structure is most essential.

This recommendation was stated in my memo to you dated September 14, 1972. However, no action has been taken, probably due to the postponement of the construction program.

As the contract will be tendered the later part of this year, we strongly feel that the operation of placing the fill should be carried out immediately. The Soil Mechanics Section will supply the sketch showing limit and height of the fill.

Walter Lin

W. Lin,
Reg. Structural Design Engineer.

WL/ac

c.c. *M.* Devata
T. Fletcher



Mr. E. A. Fletcher,
Planning and Design Office,
Central Region.

G. C. E. Burkhardt,
Structural Planning Office,
3501 Dufferin Street.

June 19, 1975.

C.W.R. Overhead,
W.P. 310-66, Site 1-165,
Highway 54, District 4.

Reference is made to the Regional Review for the above mentioned project. At that time the question was raised regarding the method to be employed to achieve the desired stability of the approach fill to the structure. The timing for the construction of the abutments should be part of this overall review.

Correspondence concerning this subject was received from Mr. W. Lin, Structural Office, a copy of which was forwarded to you. This office has engaged in various discussions with the Soils Mechanics Section and yourself about this matter.

The Soils Mechanics Section prefers their previously recommended method of placing the approach fill six months or more prior to construction of the abutments, rather than an additional surcharge to the pre-loading method. We would like to mention also, that the surcharge method would require considerably more property for the additional fill and associated berms. It is our understanding that this additional property may not be available to the Ministry.

We were informed by you that the Board Order from the Ministry of Transport has not been granted as of this date and therefore additional time should be available.

Based on our investigation and comments mentioned above our office therefore recommends that the necessary documents for a separate pre-loading contract be prepared as soon as possible. This will enable the M.T.C. to call an advanced contract after the Board Order has been received.



R. A. Jeffries,
STRUCTURAL PLANNING SUPERVISOR,
for:
G. C. E. Burkhardt,
REG. STRUCTURAL PLANNING ENG.

RAJ:lm

c.c. M. Devata ✓
W. Lin
D. A. Waller





Memorandum

To: Mr. D. Waller
Construction Engineer
Hamilton District

From: Materials and Testing Office
Central Region

Attention: Mr. K. Sarritts

Date: 14 November 1975

Our File Ref.

In Reply to

7-F-25

Subject:

Placing of Approach Fill
Embankments to C.N.R.

Contract 75-135

W-P 202-63-04

The original recommendation by the Soils Mechanics Section was to strip the topsoil from the embankment area prior to placing the fill material. However, in view of:

1. The high water table in the shallow sandy soils overlying a deep silty clay stratum.
2. The ponding of water from recent heavy rains.
3. The use of a dozer for grubbing operations which has produced quagmire conditions,

it will be necessary to modify stripping operations.

Following our discussion on the afternoon of November 13/75 at the site with Mr. M. Devata of the Soil Mechanics Office and Mr. D. Aubin the Project Supervisor, it was agreed to proceed as follows:

1. Start the fill placing operations by first placing a sand blanket over the entire area to be covered by the new approaches. On the knobs of higher firm ground minimum stripping will be required. In the basal areas which contain water and soft re-worked topsoil, it will be necessary to remove this material either by displacement as the sand blanket is being placed or by some other method..



2. The sand fill should be placed in one lift varying in depths from 2' on the knolls to 4' in the hollows. This fill material should be of sufficient depth and compacted to a density that will support hauling equipment.
3. The fines content (material passing the #200 sieve) of the sand borrow should not exceed 15%.
4. Where feasible drainage ditches should be provided along the toe of slope of the new embankment.
5. The stripping operation should be closely supervised, particularly in the area of the perched structure abutments. Otherwise, there may be some settlement under the fill which will damage the structure.
6. As soon as the sand blanket has been placed and compacted the contractor may proceed with the remainder of the embankment construction using suitable earth borrow.

PFW/RDG/nm



P.F. Weber
Senior Soils Supervisor

R.D. Gunter
Regional Materials Supervisor

c.c. M. Devata
S. Cant
R. Minaker



Memorandum

To: Mr. M.R. Ernesaks,
Regional Manager,
Reg. Planning and Design Office,
Central Region, Toronto.

From: Structural Office,
West Building,
Downsview, Ontario.

Attention:

Date: May 7, 1976.

Our File Ref.

In Reply to

Subject: W.P. 310-66, Site 1-165
(W.P. 202-63-01)
CNR Overhead
Highway 54, District 4

64-F-25

As this project has been stockpiled for some time, the design drawings have recently been updated.

Enclosed are two sets of the latest prints of the design drawings D6720-1, -3 to inclusive which will supersede all drawings previously sent to you.

One print of drawing D-6720-1 is being forwarded to the Systems Design Project Review Section.

One set of prints is also being forwarded to the following:

Estimating Section
Regional Structural Planning Engineer
Assistant Construction Engineer (Structures)
District Office
Structural Maintenance Engineer
Soil Mechanics Section

The D4 and Special Provisions were mailed to you previously.

NZ/ac
Encl.

N. Zoltay
N. Zoltay,
Structural Contract
Specifications Engineer.

c.c. J. Wear
B. Giroux
G. Burkhardt
A.E. McKim
C.R. Robertson
W. Birch
C. Mirza
R. Fitzgibbon
J. Anderson



Mr. A.E. McKim
Assistant Construction Engineer
Construction Office
Central Building, Downsview

K. Luczka

Soil Mechanics Section
Geotechnical Office
West Building, Downsview

September 17, 1976

CNR Overhead Structure, Hwy. 54
Cainsville, District 4, Hamilton
W.P. 310-66-00, Site 11-65, Cont. No. 76-15

A meeting was held in the office of the Soil Mechanics Section on September 13, 1976 amongst Messrs. M. Devata, K. Luczka, M. Almer, V. Korlu and B. Ly, to resolve the pile driving problems encountered during construction of this project. According to the design drawings (D-6720-3) the abutments are to be supported on piled foundations composed of #14 timber piles and the piles are to be driven to elev. 690.0. During construction it was discovered that the piles could not be driven to the designated elevations.

It was agreed in this meeting that as a remedial measure the pile driving should be controlled by Hiley Formula and the piles should be driven at least 10 ft. into the natural ground (i.e. to elev. 705.0 or lower, assuming the ground surface at elevation 715.0) in order to attain the design load of 15 tons per pile. It was also agreed that a Demag 12 hammer would be used in accordance with NTC practice when Hiley Formula is applied.

B. Ly

B. Ly
Senior Engineer

For: M. Devata
Supervising Engineer

MD/BL/gs

cc: C. Grebski
J.M. Cramie
D.A. Waller
Files
Record Services

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. J. B. Wilkes,
Executive Director,
Highway Engineering Division.

FROM: J. K. Livingston

ATTENTION:

DATE: February 1, 1977

OUR FILE REF.

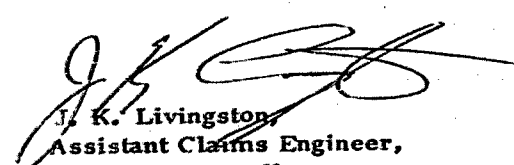
IN REPLY TO

SUBJECT:

202-42-04
Contract 75-135, C. N. R. Crossing, 0.5 miles
south of Cainsville, Hamilton District
76-15

Enclosed please find two copies of the contractor's claim submission of January 6, 1977. Although we have requested the contractor to resubmit his claim, it would appear that the request for compensation will involve foundation problems and lack of detail in design with regard to the location and placement of the embankment.

We would therefore request a report from your office concerning the above, plus any other gratuitous information which may be available.


J. K. Livingston,
Assistant Claims Engineer,
(for) J. W. MacDougall,
Claims Engineer.

JKL/jm
attach.

cc: M. Devata ✓





Memorandum

WP 310-66
69F-25
CONT. 76-15

To: Mr. J.K. Livingston
Assistant Claims Engineer
Engineering Claims Office
Central Building, Downsview

From: Soil Mechanics Section
Engineering Materials Office
West Building, Downsview

Attention:

Date: February 25, 1977

Our File Ref.

In Reply to

40 P1-42

Subject: Re: Contract 75-135, C.N.R. Overhead Approaches
0.5 Miles South of Cainsville
Hwy. 54, District 4, Hamilton

In your memorandum dated February 1, 1977, you have indicated that the request for additional compensation by the contractor was due to foundation problems and also lack of detail in design with regard to the location and placement of the embankment. This subject was discussed with you verbally on February 2, 1977 at your office and also with the Regional Geotechnical Section at a later date. The following summarizes our verbal comments provided to you, together with information obtained from the Regional Geotechnical Section.

Background Information

The investigation for the above mentioned C.N.R. overhead was carried out during May, 1969 and a foundation report was submitted August 12, 1969. In order to minimize the possibility of differential settlements, the foundation report recommended that the approach fills should be constructed to the abutment footing formation level and left in place for a period of six months. This was brought to the attention of the Regional Structural Planning Section by Mr. W. Lin of the Structural Office, in a memorandum dated September 14, 1972. This project, due to some reasons, was removed from the 1973 program and stockpiled. In 1975 this project was reactivated.

As a result of this the Central Region Planning and Design Section prepared the necessary documents with the assumption that the structure and approach embankment construction would be carried out under one contract. The material required for the approaches was specified as suitable earth borrow (from outside of the right of way). During the preparation of the contract documents, Mr. R.A. Jefferies of the Regional Structural Planning Section alerted Mr. E.A. Fletcher, Planning and Design Office, Central Region, in a memorandum dated June 19, 1975, stating that the Soil Mechanics Section preferred their previously recommended method of placing approach fills to full height and left in place for a period of six months prior to the construction of structure foundations. In order to satisfy this requirement, the Regional Planning and Design Section decided to separate the approach fill earth grading as an advance contract. The Soil Mechanics Section was not requested to provide any input with regard to the preparation of contract documents for the grading project. The advance grading contract was carried out as an invitation bid by the District 4, Hamilton.

cont'd.....

Construction Problems During Grading Operation by the Contractor

During construction this Section was requested by Mr. P. Weber of the Regional Geotechnical Office to visit the site since the contractor was having some difficulties in carrying out the stripping operations due to wet weather conditions. A site meeting was held on November 13, 1975, attended by Messrs. K. Sarritts, D. Aubin, P. Weber and M. Devata. It was agreed that in the basinal areas which contained water and re-worked topsoil, it would be necessary to remove this material during placing of the sand blanket.

A letter containing the detailed recommendations with regard to this treatment submitted by Mr. P. Weber to the District dated November 14, 1975, is enclosed.

We would like to bring to your attention the following:

1. As per item 2 of the contract, stripping should have been carried out under the approach fills and within the total limits of the embankment.
2. The Soil Mechanics Section was not aware that the tender quantities shown in the contract documents were inadequate to construct the necessary approach embankments. Generally, such work will be carried out by the Planning and Design Section. We could have provided, if requested, the details of the required limits of embankment in the critical areas based on the limited amount of availability of earth borrow.
3. The additional stripping recommended in some localized areas during construction was necessary in order to ensure the stability of the approach embankments in the close proximity of the CNR tracks.

We believe that the aforementioned information will provide answers to your question and should you require any additional information, please contact us.


M. Devata
Supervising Engineer

Encl.

MD/gs

cc: Files (Cont. 76-15)
Record Services

40 P. 11