

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 40 P6-16

DIST. 3 REGION

W.P. No. 142-81-01

CONT. No. 84-84

W. O. No.

STR. SITE No. 25-265

HWY. No. 8

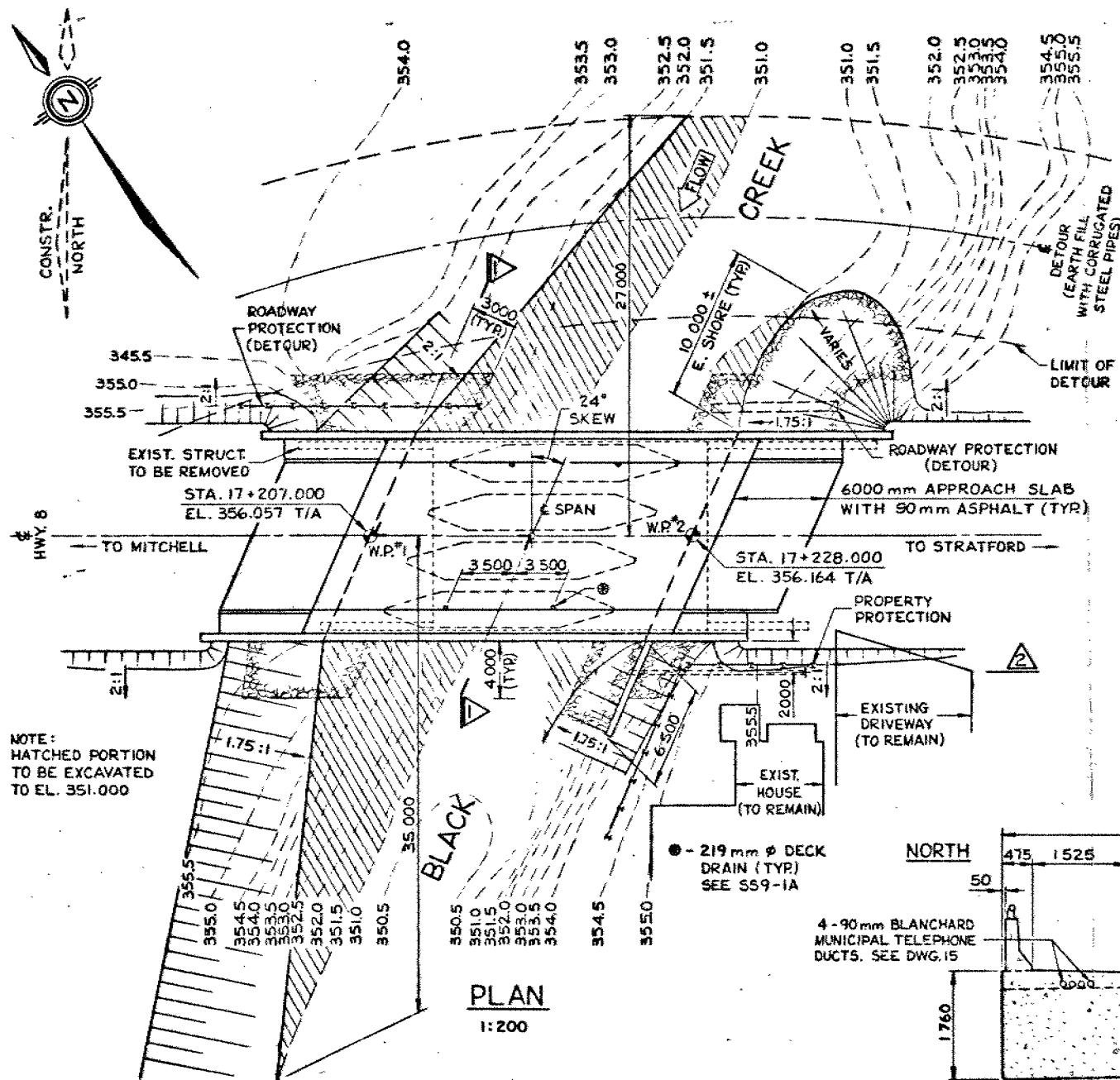
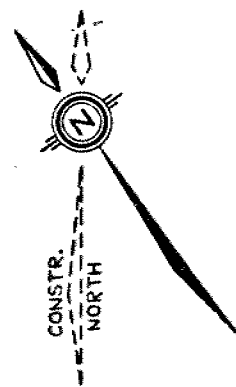
LOCATION Black Creek Bridge  
Replacement, Sebringville

No. of PAGES -

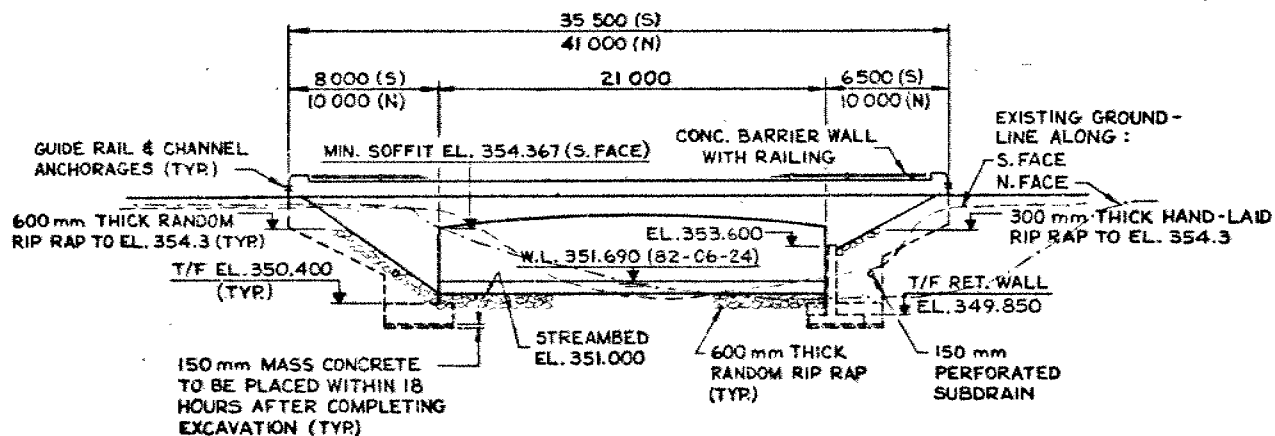
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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

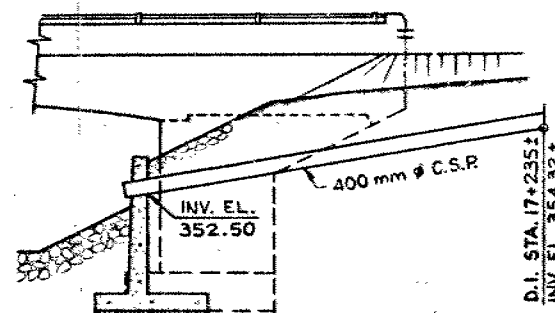
REMARKS:



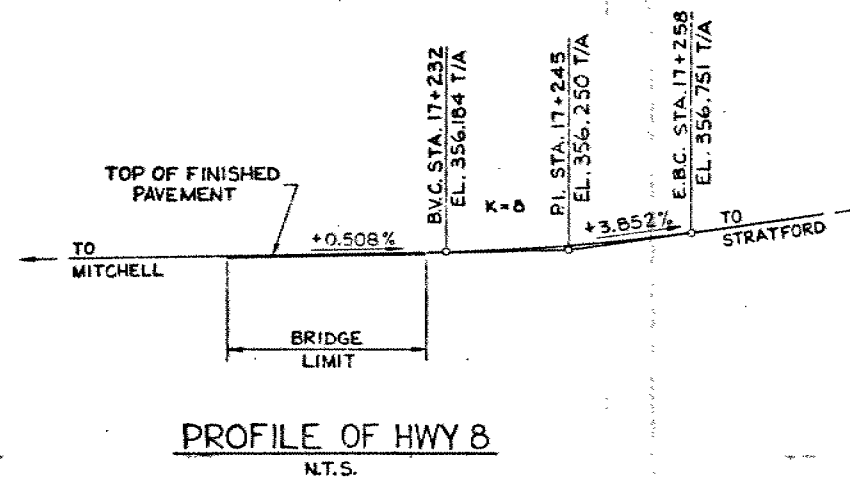
PLAN  
1:200



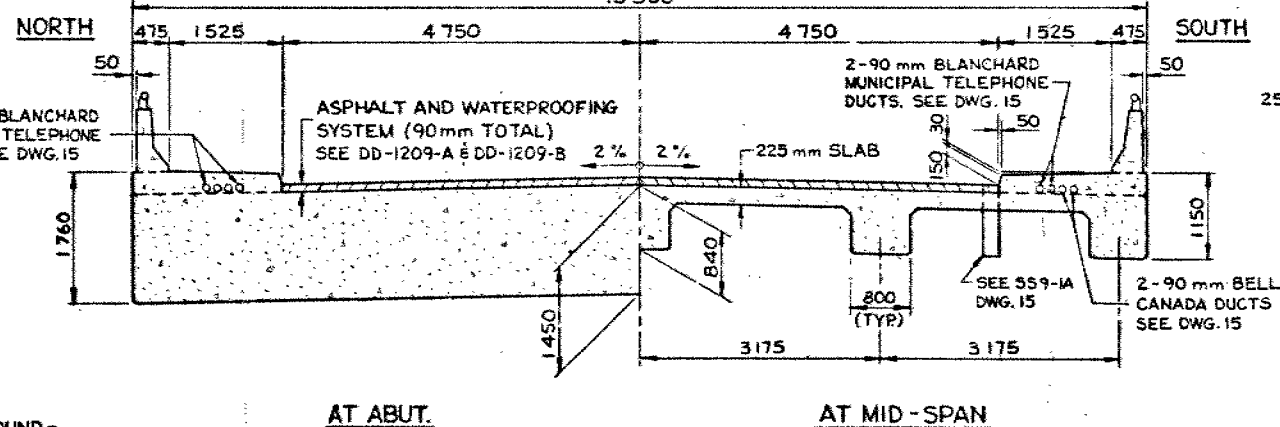
ELEVATION  
1:200



1:100



PROFILE OF HWY 8  
N.T.S.



AT ABUT.

AT MID-SPAN



NOTE:  
FOR DETAILS OF C.S.R. SEE  
GRADING/DRAINAGE DWGS.

BM 357.705  
TOP S.E. CORNER CONC. DOOR  
SILL OF BR. CHURCH  
N. 45 Lt. 16 + 976.7

DRAWING NOT TO BE SCALED  
100 mm ON ORIGINAL DRAWING

## METRIC

DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN

DIST. 3

CONT No

WP No 142-81-01

BLACK CREEK BRIDGE  
(Sebringville)  
GENERAL ARRANGEMENT

SHEET

## NOTES.

### CLASS OF CONCRETE

FOOTINGS & APPROACH SLABS — 20 MPa  
REMAINDER — 30 MPa

### REINFORCING STEEL

GRADE 400  
BAR MARKS WITH SUFFIX 'C' DENOTES  
COATED BAR.

### CLEAR COVER TO REINFORCING STEEL

	mm
FOOTINGS	100±25
ABUTS, WINGS, FRONT FACE	80±20
& RET. WALLS, BACK FACE	70±20
DECK: TOP (EXCEPT AS NOTED)	70±20
BOTTOM & SIDES	50±10
REMAINDER, UNLESS OTHERWISE NOTED	70±20

### CONSTRUCTION NOTES

FALSEWORK SUPPORTING WINGWALLS SHALL  
NOT BE REMOVED UNTIL CONCRETE IN THE  
DECK HAS REACHED A STRENGTH OF 20 MPa.

BACKFILL SHALL BE PLACED SIMULTANEOUSLY  
BEHIND BOTH ABUTMENTS KEEPING THE HEIGHTS  
OF THE BACKFILL APPROXIMATELY THE SAME.  
AT NO TIME SHALL THE DIFFERENCE IN ELEVATION  
BE GREATER THAN 600 mm.

### LIST OF DRAWINGS

- 25-172-265-1 GENERAL ARRANGEMENT
- 2 BORE HOLE LOCATION & SOIL STRATA
- 3 FOOTING LAYOUT & REINFORCING
- 4 RIGID FRAME
- 5 WEST WINGWALLS
- 6 EAST WINGWALLS
- 7 RETAINING WALL & SCREED ELEVATIONS
- 8 ROADWAY & PROPERTY PROTECTION
- 9 SOUTH BARRIER WALL
- 10 NORTH BARRIER WALL
- 11 RAILING FOR BARRIER WALL
- 12 6000 mm APPROACH SLAB
- 13 AS CONSTRUCTED ELEV. & DIM.
- 14 BRIDGE DATE & SITE NUMBER DATA
- 15 STANDARD DETAILS & TELEPHONE DUCT  
DETAILS
- 16 QUANTITIES
- 17 QUANTITIES

### LIST OF ABBREVIATIONS

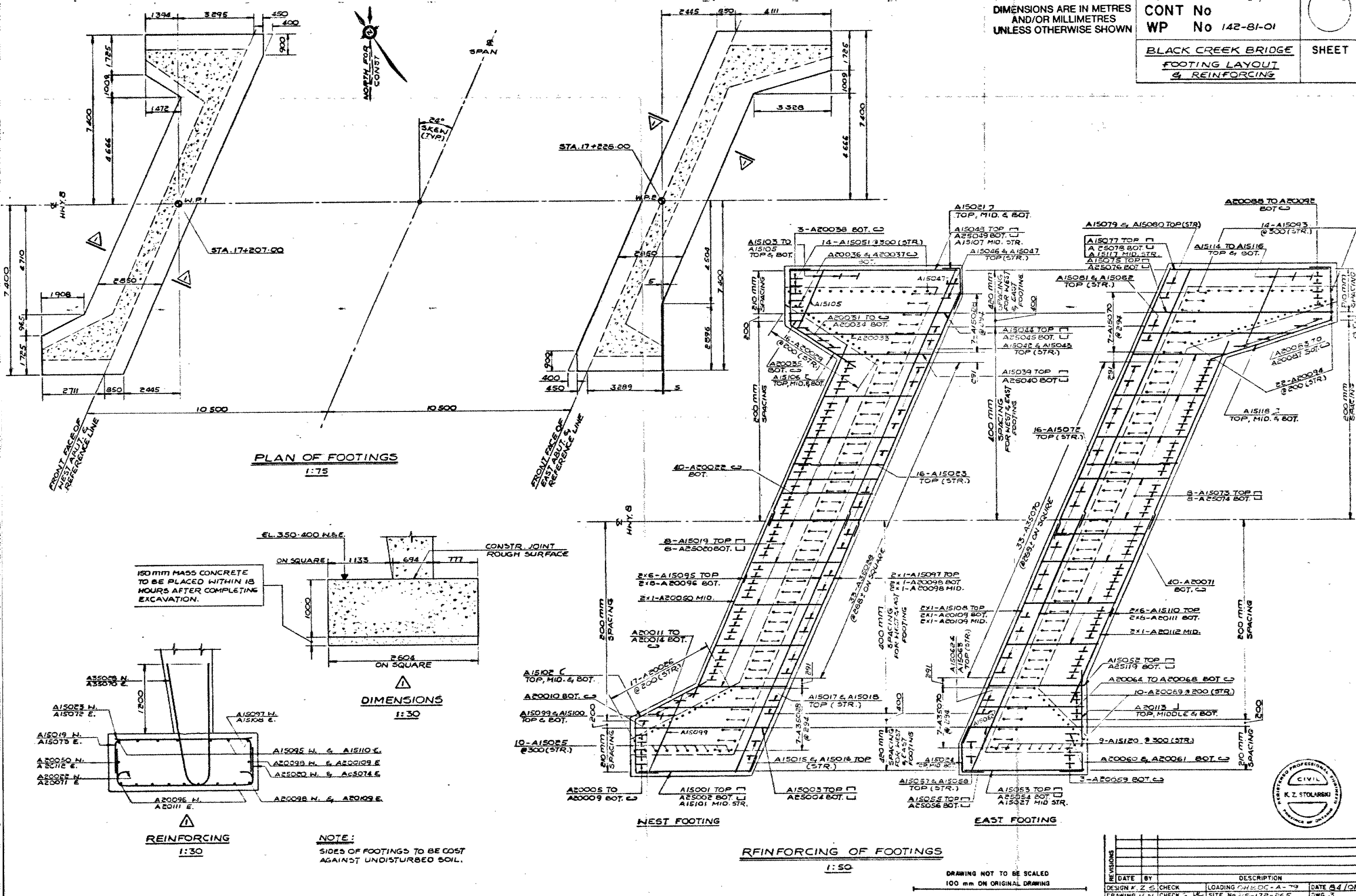
WP WORKING POINT  
T/A TOP OF ASPHALT  
T/F TOP OF FOOTING  
F.F. FRONT FACE  
B.F. BACK FACE  
E.F. EACH FACE

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	K.Z.S.	CHECK	LOADING 31-BDC-A-79 DATE 04/01
DRAWING	D.H.	CHECK	SITE No 25-172-265 DWG 1

**DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN**

**SHEET**

BLACK CREEK BRIDGE  
FOOTING LAYOUT  
& REINFORCING



# FOUNDATION INVESTIGATION REPORT

CONTRACT NO 84 - 84



Ontario

Ministry of  
Transportation and  
Communications

<u>Page No.</u>	<u>Description</u>
1	Index
2	Abbreviations and Symbols
3 - 10	Foundation Investigation Report For:  W.P. 142-81-01, Site 25-172-265 Black Creek Bridge (Sebringville)

NOTE: For purposes of the contract, this report supersedes all other foundation reports prepared by or for the Ministry in connection with the above-mentioned project.

## EXPLANATION OF TERMS USED IN REPORT

2

**N VALUE:** THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS  $\bar{N}$ .

**DYNAMIC CONE PENETRATION TEST:** CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

**CONSISTENCY:** COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH ( $c_u$ ) AS FOLLOWS:

$c_u$ (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

**DENSENESS:** COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND / OR STRENGTH.

**RECOVERY:** SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

**MODIFIED RECOVERY:** SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

**JOINTING AND BEDDING:**

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	> 3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

## ABBREVIATIONS AND SYMBOLS

### FIELD SAMPLING

SS SPLIT SPOON	TP THINWALL PISTON
WS WASH SAMPLE	OS OSTERBERG SAMPLE
ST SLOTTED TUBE SAMPLE	RC ROCK CORE
BS BLOCK SAMPLE	PH T W ADVANCED HYDRAULICALLY
CS CHUNK SAMPLE	PM T W ADVANCED MANUALLY
TW THINWALL OPEN	FS FOIL SAMPLE

### MECHANICAL PROPERTIES OF SOIL

$m_v$	$\text{kPa}^{-1}$	COEFFICIENT OF VOLUME CHANGE
$C_c$	1	COMPRESSION INDEX
$C_s$	1	SWELLING INDEX
$C_\alpha$	1	RATE OF SECONDARY CONSOLIDATION
$c_v$	$\text{m}^2/\text{s}$	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
$T_v$	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
$\sigma'_{vo}$	kPa	EFFECTIVE OVERBURDEN PRESSURE
$\sigma'_p$	kPa	PRECONSOLIDATION PRESSURE
$\tau_f$	kPa	SHEAR STRENGTH
$c'$	kPa	EFFECTIVE COHESION INTERCEPT
$\phi'$	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
$c_u$	kPa	APPARENT COHESION INTERCEPT
$\phi_u$	-°	APPARENT ANGLE OF INTERNAL FRICTION
$\tau_R$	kPa	RESIDUAL SHEAR STRENGTH
$\tau_r$	kPa	REMOULDED SHEAR STRENGTH
$S_t$	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

### STRESS AND STRAIN

$u_w$	kPa	PORE WATER PRESSURE
$r_u$	1	PORE PRESSURE RATIO
$\sigma$	kPa	TOTAL NORMAL STRESS
$\sigma'$	kPa	EFFECTIVE NORMAL STRESS
$\tau$	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
$\epsilon$	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
$\mu$	1	COEFFICIENT OF FRICTION

### PHYSICAL PROPERTIES OF SOIL

$\rho_s$	$\text{kg}/\text{m}^3$	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	$e_{min}$	1, %	VOID RATIO IN DENSEST STATE
$\gamma_s$	$\text{KN}/\text{m}^3$	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	$I_D$	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
$\rho_w$	$\text{kg}/\text{m}^3$	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
$\gamma_w$	$\text{KN}/\text{m}^3$	UNIT WEIGHT OF WATER	$S_r$	%	DEGREE OF SATURATION	$D_n$	mm	n PERCENT - DIAMETER
$\rho$	$\text{kg}/\text{m}^3$	DENSITY OF SOIL	$w_L$	%	LIQUID LIMIT	$C_u$	1	UNIFORMITY COEFFICIENT
$\gamma$	$\text{KN}/\text{m}^3$	UNIT WEIGHT OF SOIL	$w_p$	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
$\rho_d$	$\text{kg}/\text{m}^3$	DENSITY OF DRY SOIL	$w_s$	%	SHRINKAGE LIMIT	q	$\text{m}^3/\text{s}$	RATE OF DISCHARGE
$\gamma_d$	$\text{KN}/\text{m}^3$	UNIT WEIGHT OF DRY SOIL	$I_p$	%	PLASTICITY INDEX = $w_L - w_p$	v	m/s	DISCHARGE VELOCITY
$\rho_{sat}$	$\text{kg}/\text{m}^3$	DENSITY OF SATURATED SOIL	$I_L$	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
$\gamma_{sat}$	$\text{KN}/\text{m}^3$	UNIT WEIGHT OF SATURATED SOIL	$I_C$	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
$\rho'$	$\text{kg}/\text{m}^3$	DENSITY OF SUBMERGED SOIL	$e_{max}$	1, %	VOID RATIO IN LOOSEST STATE	j	$\text{KN}/\text{m}^2$	SEEPAGE FORCE
$\gamma'$	$\text{KN}/\text{m}^3$	UNIT WEIGHT OF SUBMERGED SOIL						

# FOUNDATION INVESTIGATION REPORT

3

For

W.P. 142-81-01, Site: 25-172-265

Black Creek Bridge (Sebringville)

Hwy. 8, District 3, Stratford

## INTRODUCTION:

This report summarizes the results of the foundation investigation required for the proposed bridge replacement.

The fieldwork was conducted during the period from 82 09 13-14 utilizing a continuous-flight auger machine equipped with 82 mm I.D. hollow-stem augers.

This work consisted of 3 sampled boreholes/dynamic cone penetration tests.

## SITE DESCRIPTION

The site is located approximately 5 km NW of Stratford where Hwy. 8 crosses Black Creek in Sebringville. (Perth Co., Ellice Twp. and Downie Twp., Conc. I, Lot 18).

Physiographically, the site lies in the Stratford Till Plain, a region in which the soil is generally a uniform brown calcareous silty clay till.

The land adjacent to the site is residential except at the NE which is commercial (feed mill).

## SUBSURFACE CONDITIONS

### General

The Record of Borehole Sheets, (Appendix) illustrate the conditions at the borehole locations. The locations and elevations of the boreholes, and stratigraphical profiles based on the borehole data, are shown on Drawing No. 2.

The present grade of Hwy. 8 lies approximately 4 m above the valley of Black Creek.

The overburden at this site is generally composed of silty clay till of low plasticity. Surface deposits ranging from 1.5 to 2.1 m in thickness were encountered at BH #2 and #3.

Silty Clay (CL); some sand, trace gravel

In the creek valley, 1.2 m (thickness) of stiff silty clay was encountered on the surface at BH #1.

Sandy Gravel; some silt, trace clay

At BH #1 in the creek valley 0.9 m (thickness) of very dense sandy gravel was encountered below the surface silty clay. Portions of this deposit exhibited very slight plasticity.

Silty Sand; some/with gravel, trace clay and organics

At BH #2, the surface 1.5 m (thickness) is composed of this compact material which is probably fill.

Silty Clay (CL) to Silt; with sand, some gravel

The major overburden deposit at this site consists of this generally hard till material. At BH #2 and #3 an upper firm to very stiff zone, 2 to 4 m in thickness, contains traces of organics.

Physical properties of the material, as determined from field and laboratory tests, are summarized below:

	<u>Range</u>	<u>Average</u>	<u>Median</u>
Natural Moisture Content (w)	4.5 - 10.5 %	7.2 %	7.0 %
Liquid Limit ( $W_L$ )	11.5 - 24.5 %	16.3 %	15.5 %
Plastic Limit ( $W_p$ )	10.5 - 18.5 %	13.0 %	11.5 %

The material did not fail during field vane shear testing, indicating undisturbed shear strengths in excess of 107 kPa. From the results of the standard penetration test it is estimated that the shear strength of the hard portion of this deposit is in excess of 150 kPa.

Figure 1 illustrates a typical grain size distribution for this deposit.



Groundwater

At the time of the field investigation, the groundwater elevation was established at 352 m, the same level as Black Creek.



*D. H. Dundas*

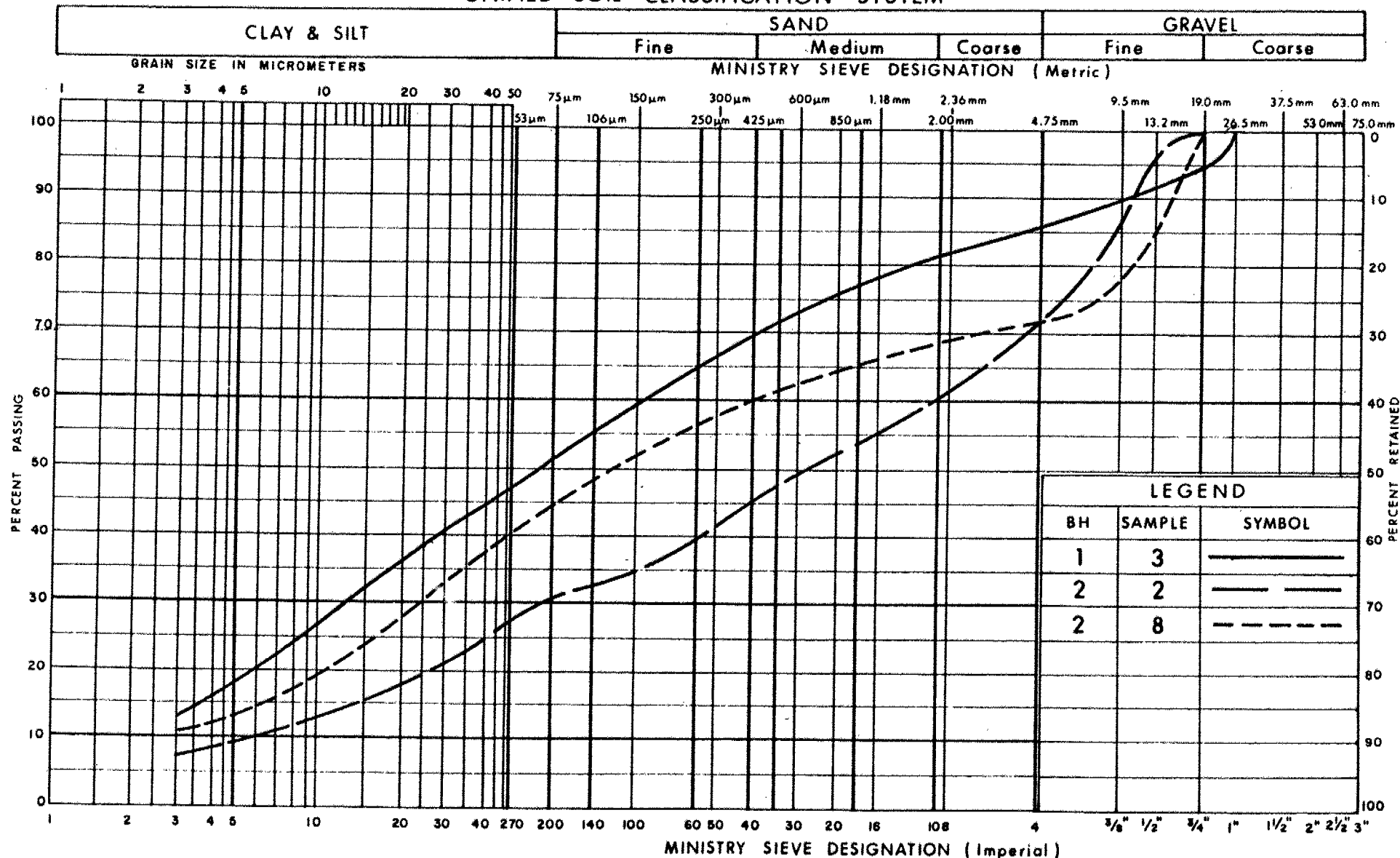
D. H. Dundas, P. Eng.  
Foundations Engineer

*K. G. Selby*

K. G. Selby, P. Eng.  
Chief Foundations Engineer (West)

## APPENDIX

## UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of  
Transportation and  
Communications

**GRAIN SIZE DISTRIBUTION**  
**SILTY CLAY TO SILT (Till)**  
**WITH SAND SOME GRAVEL**

**FIG No 1**

**W P 142-81-01**



Ministry of  
Transportation and  
Communications  
Ontario

# RECORD OF BOREHOLE No 1

METRIC 8

W P 142-81-01 LOCATION Sta. 17 + 210, 11.8 m Lt. of Hwy. 8  
DIST 3 HWY 8 BOREHOLE TYPE Hollow Stem Auger  
DATUM Geodetic DATE 82 09 13  
ORIGINATED BY DD  
COMPILED BY DD  
CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100					
352.9	Ground Surface												
0.0	Silty Clay (CL)												
351.7	Some Sand, trace		1	SS	11		352						
1.2	Gravel, Stiff		2	SS	60	8 cm							
350.8	Sandy Gravel, some		3	SS	120								
2.1	Silt, trace Clay, V.		4	SS	200		350						15 33 43 9
	Dense		5	SS	120		348						23 28 42 7
	Silty Clay (CL) to		6	SS	60	15 cm							18 31 42 9
	Silt with Sand		7	SS	120		346						
	Some Gravel		8	SS	60	15 cm							
	Hard		9	SS	120		344						
	(Till)		10	SS	102		342						
340.3													
12.6	End of Borehole												

+3, x5: Numbers refer to  
Sensitivity

20  
15 5 (%) STRAIN AT FAILURE  
10



Ministry of  
Transportation and  
Communications  
Ontario

# RECORD OF BOREHOLE No 2

METRIC

9

W P 142-81-01 LOCATION Sta. 17 + 200, 13.0 m Rt. of Hwy. 8  
DIST 3 HWY 8 BOREHOLE TYPE Hollow Stem Auger  
DATUM Geodetic DATE 82 09 14  
ORIGINATED BY JH  
COMPILED BY DD  
CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT $\gamma$	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
355.7	Ground Surface							20 40 60 80 100	20 40 60 80 100	W <sub>p</sub>	W	W <sub>L</sub>		
0.0	Silty Sand, some/with Gravel, trace Clay & Organics, Compact		1	SS	16			○ UNCONFINED + FIELD VANE						28 50 18 4
354.2			2	SS	16		354	● QUICK TRIAXIAL × LAB VANE						28 40 26 6
1.5			3	SS	13									
	trace organics firm to very stiff		4	SS	6		352							
			5	SS	9									
			6	SS	16									
			7	SS	33		350							
	Silty Clay (CL) to Silt with Sand		8	SS	56									27 27 37 9
	Some Gravel		9	SS	60/15 cm		348							
	Hard (Till)		10	SS	77		346							
			11	SS	97									
343.7			12	SS	60/15 cm		344							
12.0	End of Borehole													PCu > 107 kPa

+3, x5: Numbers refer to  
Sensitivity

20  
15  
10  
5  
5 (%) STRAIN AT FAILURE



Ministry of  
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Ontario

# RECORD OF BOREHOLE No 3

METRIC

10

W P 142-81-01 LOCATION Sta. 17 + 254, 11.0 m Lt. of Hwy. 8  
DIST 3 HWY 8 BOREHOLE TYPE Hollow Stem Auger  
DATUM Geodetic DATE 82 09 14

ORIGINATED BY JH

COMPILED BY DD

CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W <sub>p</sub> NATURAL MOISTURE CONTENT W LIQUID LIMIT W <sub>L</sub> WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
356.6	Ground Surface										
0.0											
	trace organics stiff to very stiff		1	SS	17						
			2	SS	10						
			3	SS	26						
			4	SS	74						
	Silty Clay (CL) to Silt with Sand		5	SS	77						
	Some Gravel		6	SS	70						
	Hard		7	SS	26						
	(Till)										
347.2			8	SS	120						
9.4	End of Borehole										

+3, x5: Numbers refer to  
Sensitivity

20  
15-5 (%) STRAIN AT FAILURE  
10

**ENGINEERING MATERIALS OFFICE  
PAVEMENT & FOUNDATION DESIGN SECTION**

WP 142-81-01 DIST 3  
HWY 8 STR SITE 25-265  
Black Creek Bridge Replacement,  
Sebringville

**DISTRIBUTION**

V.F. Boehnke (2)  
J.R. Roy  
R. Carney  
D.A. Walker (2)  
K. Bassi  
B.J. Giroux  
R. Hore  
  
A. Crowley (Cover Only)  
T.J. Kovich (Cover Only)

**Files**

# FOUNDATION INVESTIGATION REPORT

For

W.P. 142-81-01, Site: 25-265

Black Creek Bridge Replacement, Sebringville

Hwy. 8, District 3, Stratford

## INTRODUCTION:

This report summarizes the results of the foundation investigation required for the proposed bridge replacement.

The fieldwork was conducted during the period from 82 09 13-14 utilizing a continuous-flight auger machine equipped with 82 mm I.D. hollow-stem augers.

This work consisted of 3 sampled boreholes/dynamic cone penetration tests.

## SITE DESCRIPTION

The site is located approximately 5 km NW of Stratford where Hwy. 8 crosses Black Creek in Sebringville. (Perth Co., Ellice Twp. and Downie Twp., Conc. I, Lot 18).

Physiographically, the site lies in the Stratford Till Plain, a region in which the soil is generally a uniform brown calcareous silty clay till.

The land adjacent to the site is residential except at the NE which is commercial (feed mill).

## SUBSURFACE CONDITIONS

### General

The Record of Borehole Sheets, (Appendix) illustrate the conditions at the borehole locations. The locations and elevations of the boreholes, and stratigraphical profiles based on the borehole data, are shown on Drawing No. 1428101-A.

The present grade of Hwy. 8 lies approximately 4 m above the valley of Black Creek.



The overburden at this site is generally composed of silty clay till of low plasticity. Surface deposits ranging from 1.5 to 2.1 m in thickness were encountered at BH #2 and #3.

Silty Clay (CL); some sand, trace gravel

In the creek valley, 1.2 m (thickness) of stiff silty clay was encountered on the surface at BH #1.

Sandy Gravel; some silt, trace clay

At BH #1 in the creek valley 0.9 m (thickness) of very dense sandy gravel was encountered below the surface silty clay. Portions of this deposit exhibited very slight plasticity.

Silty Sand; some/with gravel, trace clay and organics

At BH #2, the surface 1.5 m (thickness) is composed of this compact material which is probably fill.

Silty Clay (CL) to Silt; with sand, some gravel

The major overburden deposit at this site consists of this generally hard till material. At BH #2 and #3 an upper firm to very stiff zone, 2 to 4 m in thickness, contains traces of organics.

Physical properties of the material, as determined from field and laboratory tests, are summarized below:

	<u>Range</u>	<u>Average</u>	<u>Median</u>
Natural Moisture Content (w)	4.5 - 10.5 %	7.2 %	7.0 %
Liquid Limit ( $W_L$ )	11.5 - 24.5 %	16.3 %	15.5 %
Plastic Limit ( $W_p$ )	10.5 - 18.5 %	13.0 %	11.5 %

The material did not fail during field vane shear testing, indicating undisturbed shear strengths in excess of 107 kPa. From the results of the standard penetration test it is estimated that the shear strength of the hard portion of this deposit is in excess of 150 kPa.

Figure 1 illustrates a typical grain size distribution for this deposit.

#### Groundwater

At the time of the field investigation, the groundwater elevation was established at 352 m, the same level as Black Creek.

## DISCUSSION AND RECOMMENDATIONS

It is proposed to replace the existing bridge with a single span concrete rigid frame beam-type structure and raise the grade of the road by less than 0.5 m at the south abutment.

It is also proposed to construct a temporary detour immediately to the east of the structure using Bailey bridges.

The existing single span steel truss bridge is supported on spread footings founded at approximately elev. 349.9 m (according to the original structural drawing No. 729 dated May 11, 1921).

### General Recommendations (Applicable To All Alternatives)

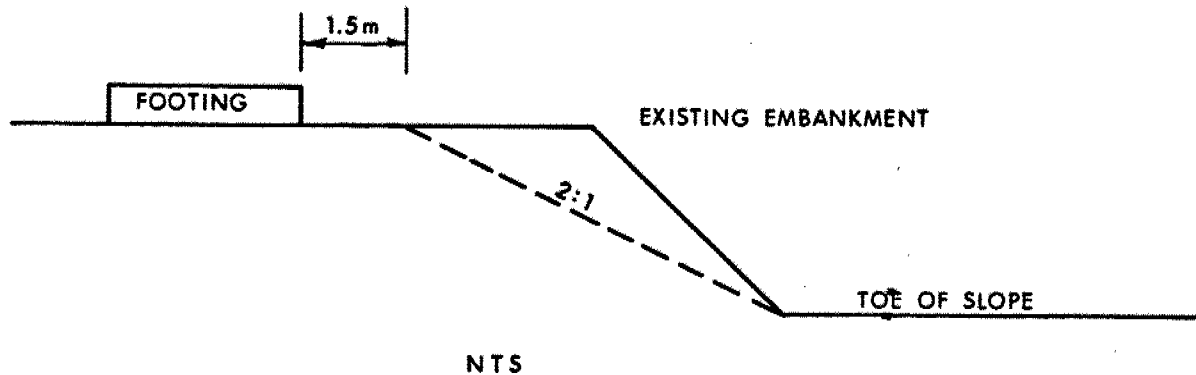
- Earth pressure acting on abutments and retaining walls should be computed as per Subsection 6.6.1.2.2 of the O.H.B.D.C. assuming a yielding foundation with  $K_a = 0.33$  for granular backfill.
- For frost protection, cover should be greater than 1.2 m.
- No stability problems are anticipated for embankments with slopes of 2:1 or flatter. If the existing slopes adjacent to the creek are disturbed by construction, they should be protected by random rip-rap (minimum blanket thickness = 0.6 m) extending a minimum of 2 m along the creek bottom to 0.3 m above the high water level. The remainder of the slope should be protected by vegetation cover as soon as possible after construction.
- Settlements of the structure will be negligible.

### Detour

The present steep slopes along Black Creek are dependent upon vegetation cover, and the root mat provided by the mature trees, for stability and erosion protection. If this vegetation is removed the slopes should be flattened to 2:1 to ensure stability.

Bailey bridges may be supported on spread footings founded at the ground surface provided that all loose or soft material below the footing locations is removed.

The footings should be located to conform to the geometry illustrated below.



For computing sliding resistance between the base of the footing and the foundation soil, the adhesion = 60 kPa.

The following design values are recommended:

- net safe bearing pressure = 100 kPa

and for the purposes of the O.H.B.D.C.:

- Factored Bearing Capacity at U.L.S. = 200 kPa
- Bearing Capacity at S.L.S. Type II = 100 kPa

### Structure

Two alternative designs are proposed. The alternative which leads to the least expensive design should be adopted.

#### ALTERNATIVE 1 - SPREAD FOOTINGS ON TILL

The abutments can be supported on spread footings founded on hard silty clay till below the level of the existing spread footings. It is estimated that the proposed footing level would be 349.4 m - approximately 0.5 m below the level of the existing footing. In any case any soft or loose material below the elevation of the existing footings should be removed before constructing the new footings.

A de-watering scheme will be required to construct the footings and abutments in dry conditions. Note that the foundation soil should be covered as soon as possible after exposure.

For computing sliding resistance between the base of the footing and the foundation soil, the adhesion = 60 kPa.

The following design values are recommended:

- net safe bearing pressure = 300 kPa

and for the purposes of the O.H.B.D.C.:

- Factored Bearing Capacity at U.L.S. = 450 kPa
- Bearing Capacity at S.L.S. Type II = 300 kPa

#### ALTERNATIVE 2 - STEEL H-PILES IN OVERBURDEN

The abutments may be supported on steel H-piles equipped with reinforced tips and driven in accordance with MTC Standards SS 103-10 or SS 103-11. This alternative would require lengthening of the bridge span to allow for 2:1 forward slopes. For calculation purposes the following values are recommended:

<u>Pile Type</u>	<u>Ultimate Capacity</u>
310 HP 79	1500 kN/pile

The piles should be driven to elev. 344 m or below. It is anticipated that the required capacity will have been achieved by this depth.

The following design values are recommended:

<u>Pile Type</u>	<u>Safe Capacity</u>
310 HP 79	500 kN/pile

and for the purposes of the O.H.B.D.C.:

<u>Pile Type</u>	<u>Factored Capacity at U.L.S.</u>	<u>Capacity at S.L.S. Type II</u>
310 HP 79	750 kN/pile	500 kN/pile

MISCELLANEOUS

The fieldwork for this project was carried out under the supervision of Mr. D. H. Dundas, Project Foundations Engineer, and Mr. J. Hayward, student field technician. The report was written by Mr. Dundas, and reviewed by Mr. K. G. Selby, Senior Foundations Engineer. The equipment used was owned and operated by Atcost Soil Drilling Inc.



*D. H. Dundas*

D. H. Dundas, P. Eng.  
Project Foundations Engineer

*K. G. Selby*

K. G. Selby, P. Eng.  
Senior Foundations Engineer

## APPENDIX

# RECORD OF BOREHOLE No 1

METRIC

W P 142-81-01 LOCATION Sta. 17 + 210, 11.8 m Lt. of Hwy. 8 ORIGINATED BY DD  
DIST 3 HWY 8 BOREHOLE TYPE Hollow Stem Auger COMPILED BY DD  
DATUM Geodetic DATE 82 09 13 CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	20 40 60 80 100					
352.9	Ground Surface													
0.0	Silty Clay (CL)													
351.7	Some Sand, trace		1	SS	11		352							
1.2	Gravel, Stiff		2	SS	60	8 cm								
350.8	Sandy Gravel, some		3	SS	120									
2.1	Silt, trace Clay, V.		4	SS	200		350							15 33 43 9
	Dense		5	SS	120									
	Silty Clay (CL) to		6	SS	60	15 cm	348							23 28 42 7
	Silt with Sand		7	SS	120									
	Some Gravel		8	SS	60	15 cm	346							
	Hard		9	SS	120		344							
	(Till)		10	SS	102		342							18 31 42 9
340.3														
12.6	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION



# RECORD OF BOREHOLE No 2

METRIC

W P 142-81-01 LOCATION Sta. 17 + 200, 13.0 m Rt. 8 Hwy. 8 ORIGINATED BY JH  
DIST 3 HWY 8 BOREHOLE TYPE Hollow Stem Auger COMPILED BY DD  
DATUM Geodetic DATE 82 09 14 CHECKED BY DD

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
						● QUICK TRIAXIAL	x LAB VANE								
355.7	Ground Surface							20 40 60 80 100	10 20 30					GR SA SI CL	
0.0	Silty Sand, some/with Gravel, trace Clay & Organics, Compact		1	SS	16									28 50 18 4	
354.2			2	SS	16									28 40 26 6	
1.5	trace organics firm to very stiff		3	SS	13										
			4	SS	6										
			5	SS	9										
			6	SS	16										
			7	SS	33										
			8	SS	56									27 27 37 9	
			9	SS	60, 15 cm										
			10	SS	77										
			11	SS	97										
			12	SS	60, 15 cm										
		343.7													
12.0	End of Borehole												*C <sub>u</sub> > 107 kPa		

+3, x5: Numbers refer to  
Sensitivity

20  
15  
10  
5 (%) STRAIN AT FAILURE



# RECORD OF BOREHOLE No 3

METRIC

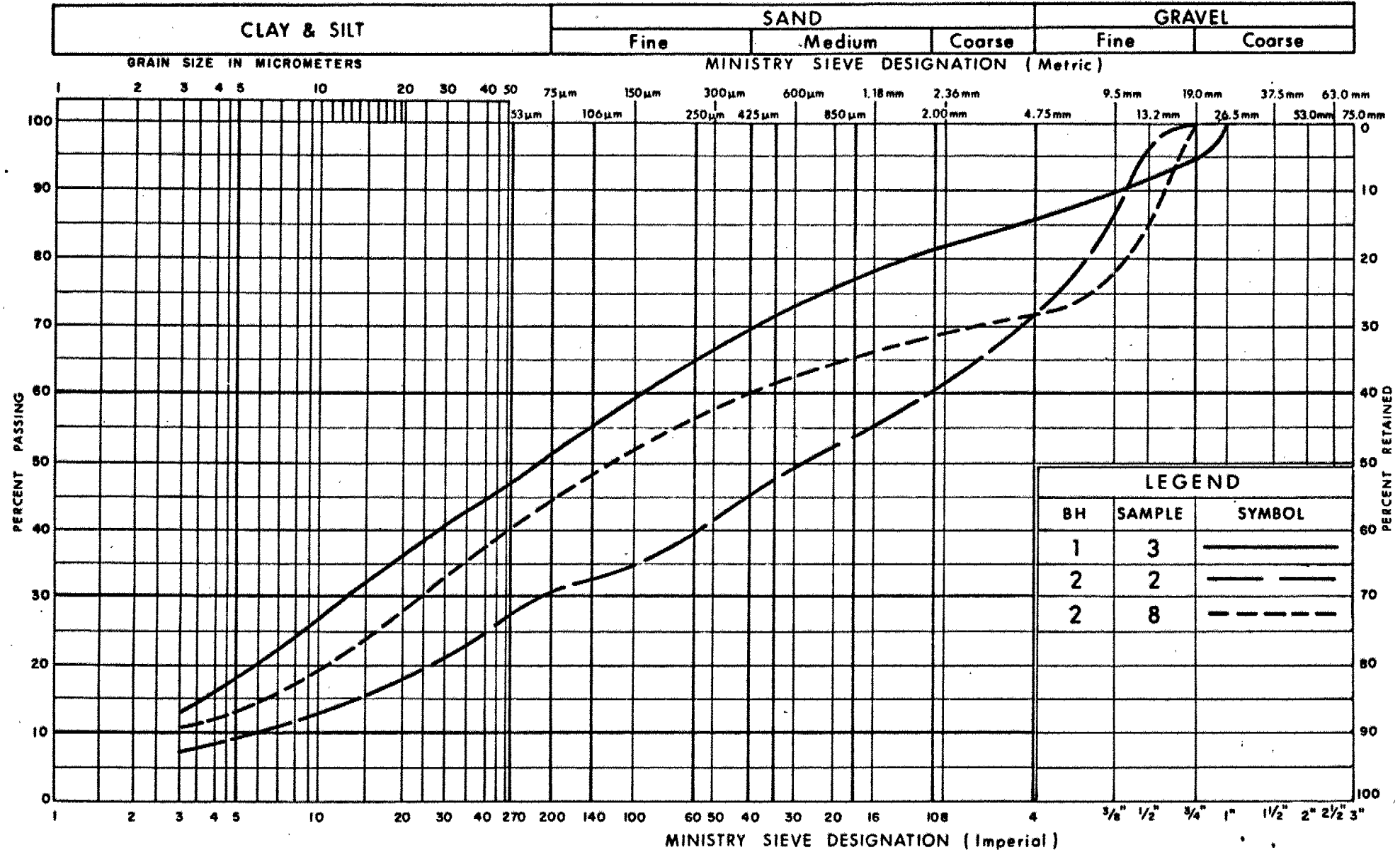
W P 142-81-01 LOCATION Sta. 17 + 254, 11.0 m Lt. of Hwy. 8  
DIST 3 HWY 8 BOREHOLE TYPE Hollow Stem Auger  
DATUM Geodetic DATE 82 09 14  
ORIGINATED BY JH  
COMPILED BY DD  
CHECKED BY DD

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W <sub>p</sub> NATURAL MOISTURE CONTENT W LIQUID LIMIT W <sub>L</sub> WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE						
356.6	Ground Surface									
0.0			1	SS	17					
	trace organics		2	SS	10					
	stiff to very stiff		3	SS	26					
			4	SS	74					
	Silty Clay (CL) to Silt with Sand		5	SS	77					
	Some Gravel		6	SS	70					
	Hard (Till)		7	SS	26					
347.2			8	SS	120					
9.4	End of Borehole									

+3, x5: Numbers refer to Sensitivity

20  
15  
10  
5 (%) STRAIN AT FAILURE

## UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of  
Transportation and  
Communications

**GRAIN SIZE DISTRIBUTION**  
**SILTY CLAY TO SILT (Till)**  
**WITH SAND SOME GRAVEL**

FIG No 1

W P 142-81-01

## EXPLANATION OF TERMS USED IN REPORT

**N VALUE:** THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS  $\bar{N}$ .

**DYNAMIC CONE PENETRATION TEST:** CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH .0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

**CONSISTENCY:** COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH ( $c_u$ ) AS FOLLOWS:

$c_u$ (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	>200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

**DENSENESS:** COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	>50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND / OR STRENGTH.

**RECOVERY:** SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

**MODIFIED RECOVERY:** SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (R Q D), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

**JOINTING AND BEDDING:**

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	>3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

## ABBREVIATIONS AND SYMBOLS

### FIELD SAMPLING

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE

### STRESS AND STRAIN

$u_w$	kPa	PORE WATER PRESSURE
$T_u$	1	PORE PRESSURE RATIO
$\sigma$	kPa	TOTAL NORMAL STRESS
$\sigma'$	kPa	EFFECTIVE NORMAL STRESS
$\tau$	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
$\epsilon$	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
$\mu$	1	COEFFICIENT OF FRICTION

### MECHANICAL PROPERTIES OF SOIL

$m_v$	$kPa^{-1}$	COEFFICIENT OF VOLUME CHANGE
$C_c$	1	COMPRESSION INDEX
$C_s$	1	SWELLING INDEX
$C_\alpha$	1	RATE OF SECONDARY CONSOLIDATION
$c_v$	$m^2/s$	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
$T_v$	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
$\sigma'_{vo}$	kPa	EFFECTIVE OVERBURDEN PRESSURE
$\sigma'_p$	kPa	PRECONSOLIDATION PRESSURE
$\tau_f$	kPa	SHEAR STRENGTH
$c'$	kPa	EFFECTIVE COHESION INTERCEPT
$\phi'$	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
$c_u$	kPa	APPARENT COHESION INTERCEPT
$\phi_u$	-°	APPARENT ANGLE OF INTERNAL FRICTION
$\tau_R$	kPa	RESIDUAL SHEAR STRENGTH
$\tau_r$	kPa	REMOULDED SHEAR STRENGTH
$S_t$	1	SENSITIVITY $= \frac{c_u}{\tau_r}$

### PHYSICAL PROPERTIES OF SOIL

$\rho_s$	$kg/m^3$	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	$e_{min}$	1, %	VOID RATIO IN DENSEST STATE
$\gamma_s$	$kn/m^3$	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	$I_D$	1	DENSITY INDEX $= \frac{e_{max} - e}{e_{max} - e_{min}}$
$\rho_w$	$kg/m^3$	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
$\gamma_w$	$kn/m^3$	UNIT WEIGHT OF WATER	$S_r$	%	DEGREE OF SATURATION	$D_n$	mm	n PERCENT - DIAMETER
$\rho$	$kg/m^3$	DENSITY OF SOIL	$w_L$	%	LIQUID LIMIT	$C_u$	1	UNIFORMITY COEFFICIENT
$\gamma$	$kn/m^3$	UNIT WEIGHT OF SOIL	$w_p$	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
$\rho_d$	$kg/m^3$	DENSITY OF DRY SOIL	$w_s$	%	SHRINKAGE LIMIT	q	$m^3/s$	RATE OF DISCHARGE
$\gamma_d$	$kn/m^3$	UNIT WEIGHT OF DRY SOIL	$I_p$	%	PLASTICITY INDEX $= w_L - w_p$	v	m/s	DISCHARGE VELOCITY
$\rho_{sat}$	$kg/m^3$	DENSITY OF SATURATED SOIL	$I_L$	1	LIQUIDITY INDEX $= \frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
$\gamma_{sat}$	$kn/m^3$	UNIT WEIGHT OF SATURATED SOIL	$I_C$	1	CONSISTENCY INDEX $= \frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
$\rho'$	$kg/m^3$	DENSITY OF SUBMERGED SOIL	$e_{max}$	1, %	VOID RATIO IN LOOSEST STATE	j	$kn/m^3$	SEEPAGE FORCE
$\gamma'$	$kn/m^3$	UNIT WEIGHT OF SUBMERGED SOIL						

**METRIC**  
DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES UNLESS  
OTHERWISE SHOWN. STATIONS  
IN KILOMETRES + METRES.

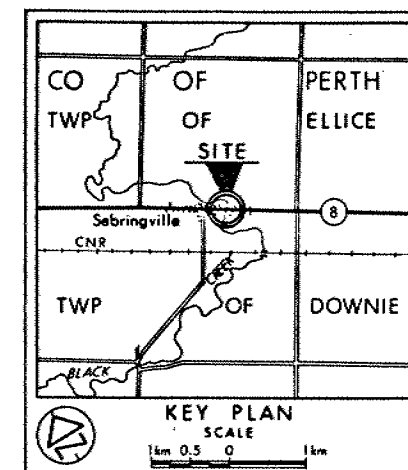
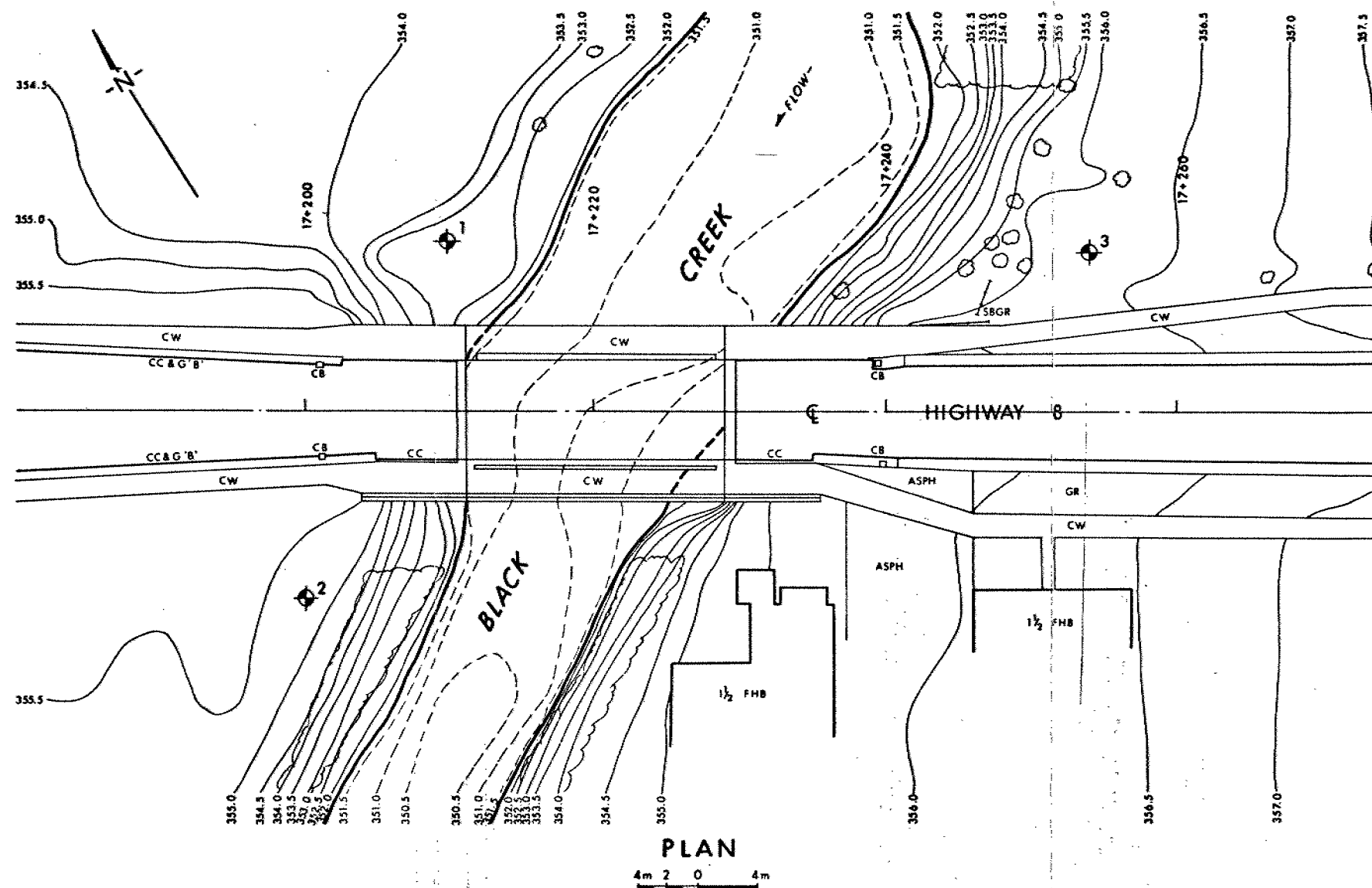
CONT No  
WP No 142-81-01



BLACK CREEK

SHEET

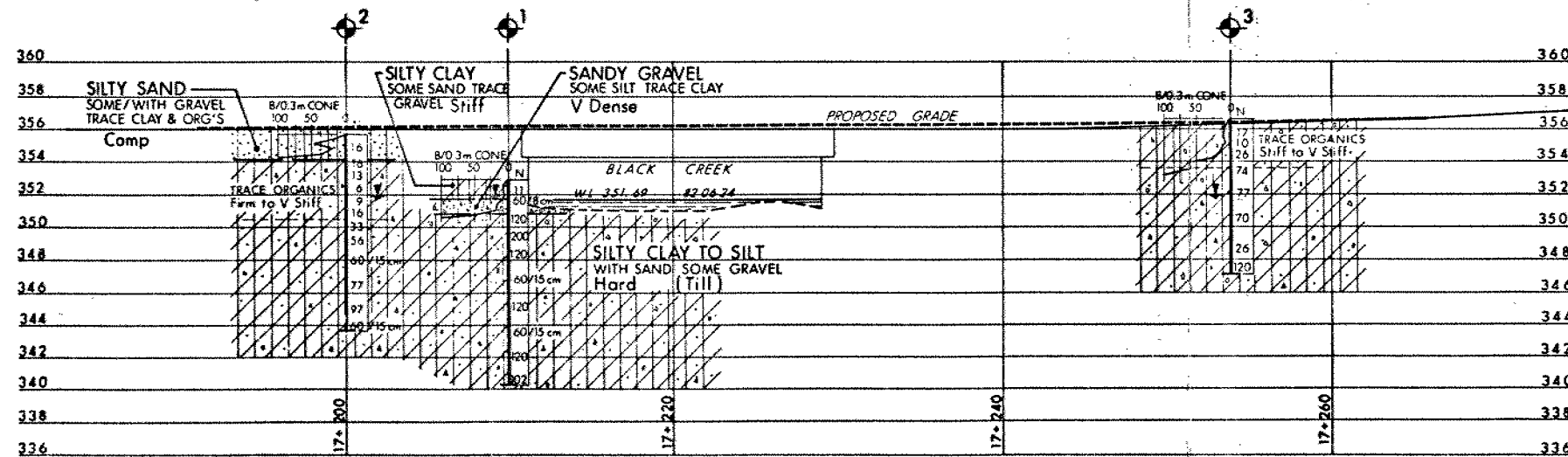
BORE HOLE LOCATIONS & SOIL STRATA



**LEGEND**

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊕ Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W.L. at time of investigation 8209

No	ELEVATION	STATION	OFFSET
1	352.9	17+210	11.8 m LT
2	355.7	17+200	13.0 m RT
3	356.6	17+254	11.0 m LT



**PROFILE HWY 8**

**NOTE**

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 102-2 of Form 100.

REV	DATE	BY	DESCRIPTION
1	821201	DD	CHECKED
2	821201	SO	CHECKED

Geocres No 40P6-16	HWY No 8	DIST 3
SUBMD DD	CHECKED	DATE 821201
DRAWN SO	CHECKED	SITE 25-265
		DWG 1428101-A

# memorandum



To: Mr. A. Ma,  
Structural Section,  
Southwest Region, London.

Date: 84 05 14

SUBJECT: Black Creek Bridge Replacement,  
Sebringville, Highway 8,  
W.P. 142-81-02, Site 25-172-265,  
District 3, Stratford.

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This memo is my reply to the memo which Mr. V. Boehnke received from Mr. H. H. Greenly, Southwest Region Construction, March 28/84, (copy attached). Since that time I have reviewed the roadway and property protection scheme shown on structure drawing -8 and have also reviewed the installation of the shoring piles with Mr. K. G. Selby. As to Mr. Greenly's query as to what shoring is removed and what stays in place, please refer to my memo to Mr. Selby dated 84 05 09, confirming his recommendations concerning the installation of the shoring piles. In brief, we have decided that the shoring piles be installed in preaugered holes and filled with concrete to the cutline for the excavation. In our opinion, it would be impractical to attempt removal of the shoring piles for this arrangement so that it will be necessary to leave the shoring in place and cut it off 1 metre below final or finished grade or "as directed by the engineer".

Mr. Greenly's second query suggesting an S.P. be included to explain our staging requirements has been considered. Usually we are only involved with providing staging requirements in the drawings or in an S.P. when the bridge itself must be built in stages. As the Black Creek bridge does not require this we did not consider it necessary to show any staging requirements. However, the overall staging of the project, ie, detour, traffic location, etc., has been handled by Planning and Design in the past and included as part of their preparation. Perhaps you would discuss the staging with P&D and suggest that they consider these requirements and include the overall staging requirements in their portion of the contract documents if they consider this necessary.

"Mass Concrete" - Tender Item 5

The mass concrete serves as a working slab however it also serves as a seal slab to preserve the soil condition under the footings. For some time now it has been Structural Office policy to call for "mass concrete" when the use of a slab is

.....2

mandatory. As in the case of Black Creek Bridge, the slab must be placed within a stipulated length of time after completing the excavation, as specified by a note on the drawings, (usually 18 hours).

On page 23 of the P.Q.P. guidelines, mass concrete is defined as a P.Q.P. item although I do not believe that everyone is in agreement because the item often requires some form of field measurement for payment purposes. I will investigate this further.



JLK/cf  
Attch.

J. L. Keen,  
Design Engineer (Southwest),  
Structural Office.

c.c. H. H. Greenly, S.W. Region Construction  
K. Z. Stolarski, Structural Office  
W. McFarlane " "

# memorandum

Structural Office  
3rd Floor  
3001 Dufferin St.  
Downsview, Ontario



To: Mr. K.G. Selby  
Senior Foundations Engineer  
Pavement & Foundation Design  
3rd Floor, Central Bldg.

Date: 1984 05 09

Re: Black Creek Bridge Replacement  
Sebringville, Hwy. 8  
W.P. 142-81-02, Site 25-172-265  
Dist. 3, Stratford

This memo is to confirm our telephone discussion 84 05 08 concerning the installation of the shoring piles for the roadway and property protection for the construction of the Black Creek Bridge. As discussed, we are concerned about the possible adverse affects from the pile driving on the adjacent properties, in particular, the house in the south-east quadrant. Also hard driving could be expected due to the hard compact state of the soil.

In view of the above, we agree with your recommendation to preauger 450 mm minimum diameter holes for the piles to the elevations and depths shown on the drawings. After placing and aligning the piles in the holes, the space around the piles would be filled with concrete to the cut line, (i.e. to the bottom of the proposed excavation). The space around the piles would be filled with granular above the cut line.

After construction of the bridge and retaining wall, the shoring walls would be cut off one metre below final finished grade, or as directed by the engineer. All material below the cut-off elevations would be left permanently in place including the timber lagging. All remaining voids would be filled with suitable granular material.

The structure drawings will be revised in accordance with the above and a covering special provision added if considered necessary. We may be able to provide for the above by suitable notation on the revised shoring drawing, i.e. drawing -6, "Roadway and Property Protection".

A handwritten signature in dark ink, appearing to read "J.L. Keen".

JLK:ac

J.L. Keen  
Design Engineer

cc: H.H. Greenly (S.W. Region Construction)  
V. Boehnke  
K.Z. Stolarski  
W. McFarlane





# memorandum

Structural Office  
4th Floor  
3501 Dufferin St.  
Downsview



To: Mr. K. Selby  
Senior Foundations Engineer  
Pavement and Foundations Design Section  
Central Building  
Downsview

Date: 1984 04 25



Re: Black Creek Bridge Replacement  
Sebringville, Hwy. 8  
W.P. 142-81-01, Site 25-265  
District 3, Stratford

Would you kindly review the piling shown on drawing -8,  
"Roadway and Property Protection", for the above bridge.

The Borehole Location and Soil Strata drawing in the Foundations Investigation and Design Report indicates hard material throughout the site. In view of this hard compact material, do you think the piles can be driven to the depth of penetration shown on drawing -8? I have enclosed a set of the structure drawings for your use.

A handwritten signature in cursive script, appearing to read "J.L. Keen".

JLK:ac  
Encl.

J.L. Keen  
Design Engineer

cc: K.Z. Stolarski

# memorandum



To: J.L. Keen  
Design Engineer  
Structural Office  
4th Floor  
3501 Dufferin Street

Date: 1984 04 25

From: Foundation Design Section  
Room 315, Central Building  
Downsview

RE: Black Creek Bridge (Replacement)  
Sebringville  
W.P. 142-81-01, Site 25-265  
Hwy. 8, District 3, Stratford

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This section has reviewed the submitted final drawings  
and special provisions for the above-noted project.

There are no comments.

*D.H. Dundas*

D.H. Dundas  
Foundations Engineer

for

K.G. Selby, P. Eng.  
Chief Foundations Engineer (West)

DHD/KGS/mmj