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GEOCRES No. 30M13-129

DIST. 6 REGION

W.P. No. 73-83-04

CONT. No.

W. O. No.

STR. SITE No. N/A

HWY. No. 9

LOCATION HWY 9 FROM SIMCOE CO. RD. 10  
EASTERLY TO HWY 27

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:



Ministry  
of  
Transportation

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## **FOUNDATION DESIGN SECTION**

# **foundation investigation and design report**

ENGINEERING MATERIALS OFFICE  
FOUNDATION DESIGN SECTION

WP 73-83-04

DIST 6

HWY 9

STR SITE

Proposed Widening of Highway 9  
From Simcoe Co. Road 10 Easterly to Highway 27

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FOUNDATION INVESTIGATION REPORT  
For  
Proposed Widening of Highway 9  
From Simcoe Co. Road 10 Easterly to Highway 27  
W.P. 73-83-04, Central Region  
District 6, Toronto

INTRODUCTION

This report summarizes the results of the foundation investigation carried out at the above-captioned site, for the proposed embankments to be constructed for the widening of Highway 9.

The field work was carried out by this office on 92 03 31 and 92 04 01 using the track mounted auger machine provided by Central Region Geotechnical Section. A total of ten (10) vertical boreholes and one(1) inclined borehole were advanced to depths ranging from 0.8 to 6.0 m by means of solid stem augers.

This report contains the factual information for the proposed embankment structures at the borehole locations shown on Drawing No.'s 738304-A to 738304-H.

SITE DESCRIPTION

The site consists of selected locations along Highway 9, between Simcoe Co. Road 10 and Highway 27 approximately, on the boundaries of the townships of Tecumseth, King and Caledon, Districts of Simcoe, King and Peel. It lies on the boundary of two physiographical regions known as Oak Ridges moraine and Schomberg clay plains (after Chapman and Putman, 1984). The Oak Ridges moraine which is on the west side of the site consists of hills that are composed of sandy or gravelly materials. The Schomberg clay plains on the east side of the site consist mainly varved clays overlying drumlinized till plains.

The topography at the site is generally hilly. Cut slopes along the existing highway are grassed and valleys are vegetated with grass and trees.

Land use at the site along the highway is mixed but generally residential and farming activities.

## INVESTIGATION PROCEDURES

### Field

The field investigation was carried out on 92 03 31 and 92 04 01, and consisted of ten(10) vertical boreholes and one(1) inclined borehole.

A continuous flight track mounted auger machine with 300 mm O.D. solid stem augers was employed to advance the boreholes. The machine was not equipped with sampling or insitu testing tools and hence only auger samples were taken during the investigation. Augering generally proceeded in steps of 0.3 m with materials removed from the borehole by the auger. Auger samples were usually taken when there is a change in material. The samples retrieved were used for identification and laboratory testing purposes. The boreholes were generally advanced to 6 m depth, which is the limit for this machine. However, some boreholes were terminated at shallower depths when competent materials were encountered. An inclined borehole was drilled on a cut face to investigate the native material underneath the frost. Due to the limitations of the auger machine, the borehole was terminated at 0.8 m depth.

Approximate borehole locations are shown on Drawing No.'s 738304-A to 738304-H.

Groundwater levels were measured in the open boreholes immediately after completion of augering. All the boreholes were backfilled upon completion.

### Laboratory

The laboratory testing program on representative samples consisted of :

- Natural Moisture Content
- Atterberg Limits
- Grain Size Distribution

The results of the laboratory testing are summarized in Table 1 in the Appendix.

### SUBSURFACE CONDITIONS

All the boreholes were advanced from the granular shoulders of the existing highway. The subsurface stratigraphy typically comprises a pavement structure of granular material overlying either fill in the area of embankments or native soils in the area of cuts. The embankment fill material is granular in nature at the west end of the site (BH 11) and cohesive in the other borehole locations (BH's 1,2,8,9).

The native subsoils vary along the length of the highway, changing from silty clay (BH's 1 to 4, 8 and 9) at the east end to silty sand (BH's 10 and 11) at the west end. Clayey Silt to Silt (Glacial Till) material can be found between the two ends (BH's 5 to 7).

The depth to groundwater table, as measured on site, varied significantly between boreholes, from 0.8 m in BH 3 to below 6 m in some of the other boreholes. In general, the depth is shallower on the east side of the site. It should be noted that the groundwater table is subject to seasonal changes and may vary from the values given in this report.

Detailed descriptions of both the soil and groundwater conditions encountered at the boreholes are shown on Table 1 - Borehole logs given in the Appendix of this report.

## DISCUSSION AND RECOMMENDATIONS

### General

The existing Highway 9 within the area of the current study has generally one lane running in each direction. It is proposed to widen it to two lanes in each direction at selected locations. The existing highway is composed of a series of fill embankments and cuts. The proposed widening will require extending the existing fill embankments out or further cutting back in the existing cuts.

Site visits have been made and detailed desk studies carried out to collect as much information available as possible. The information collected include cross-section data and information from previous soil borings done for pavement design. Based on the site observations and the desk studies, a few areas were selected for the current investigation to confirm or supplement the available information.

The following are the design and construction recommendations for the proposed works.

### Design Considerations

Cut slopes and embankment slopes should be constructed to 2H:1V or flatter gradients. In addition, where fill height is higher than 8 m, a 2 m wide mid-height berm should be provided for internal stability. Adequate slope drainage and protection from erosion should be provided for the new slopes in accordance with OPSS Standards.

### Construction Considerations

At the locations of the new fill embankments, all topsoil, organic or unsuitable material should be removed prior to placement of fill. The existing embankment slopes should be properly benched prior to receiving new fills in accordance with OPSD-208.01.

In general, all earthwork such as selection of fill and compaction should be carried out in accordance with OPSS Standards and MTO practice.

MISCELLANEOUS

The field investigation was conducted by Central Region Geotechnical Section drilling team, under the general supervision of D. Kwok, Project Foundation Engineer, using the MTO augering machine.

The report was written by D. Kwok, reviewed by B. Iyer, Senior Foundation Engineer and approved by M. Devata, Chief Foundation Engineer.



A handwritten signature in black ink, appearing to be "D. Kwok".

D. Kwok, P. Eng.  
Project Foundation Engineer

A handwritten signature in black ink, appearing to be "M. Devata".

M. Devata, P. Eng.  
Chief Foundation Engineer



## **APPENDIX**

## 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 (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

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
$r_u$	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

### MECHANICAL PROPERTIES OF SOIL

$m_v$	kPa <sup>-1</sup>	COEFFICIENT OF VOLUME CHANGE
$C_c$	1	COMPRESSION INDEX
$C_s$	1	SWELLING INDEX
$C_\alpha$	1	RATE OF SECONDARY CONSOLIDATION
$c_v$	m <sup>2</sup> /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
$S_f$	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

### PHYSICAL PROPERTIES OF SOIL

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

Table 1

## BOREHOLE LOGS

<u>BH</u>	<u>Depth</u> <u>From To</u>		<u>Soil Description</u>	<u>Approx. Depth of</u> <u>Groundwater Table</u>
1	0	1.6m	Fine to Medium Sand, some Gravel, Brown (Pavement)	5.9 m
	1.6m	3.0m	Clayey Silt, some Sand and Gravel, Brown, Trace Organics (Fill)	
	3.0m	3.2m	Topsoil, Dark grey	
	3.2m	6.0m	Silty Clay, Light Brown and Grey, appeared Soft to Firm Wet below 5.7 m Moisture Content(w)- 21.5-22% Liquid Limit(w <sub>L</sub> )- 33-41% Plastic Limit(w <sub>P</sub> )- 17-18% Grain Size Distribution(GSD) Gravel(Gr)- 0-3% Sand(Sa)- 3-9% Silt(Si)- 55-57% Clay(Cl)- 33-40%	
2	0	1.1m	Sand & Gravel, Brown (Pavement Structure)	No Free Water
	1.1m	2.0m	Clayey Silt, Trace Organics Brown (Fill)	
	2.0m	6.0m	Silty Clay, Brown and Light Grey, appeared Firm, getting Wet at 6.0 m w- 24.5%, w <sub>L</sub> - 44-51%, w <sub>P</sub> - 19-22% GSD: Gr- 1%, Sa- 1-5% Si- 37-38%, Cl- 57-60%	
3	0	0.8m	Fine to Medium Sand, Brown (Pavement Structure)	0.8 m (water flowing into the hole at Fill/Clay interface)
	0.8m	6.0m	Silty Clay, Grey, Wet appeared Soft to Firm Occasional Green Silt layers and Silty Sand pockets	

Table 1 .../cont'd  
BOREHOLE LOGS

<u>BH</u>	<u>Depth</u> <u>From To</u>		<u>Soil Description</u>	<u>Approx. Depth of</u> <u>Groundwater Table</u>
3	0.8m	6.0m	w- 24%, w <sub>L</sub> - 30%, w <sub>P</sub> - 16% GSD : Gr- 0%, Sa- 8% Si- 55%, Cl- 37%	
4	0	0.1m	Topsoil (frozen)	-
	0.1m	0.8m	Silty Clay, Brown	
5	0	1.1m	Fine to Medium Sand (Pavement Structure)	3.9 m
	1.1m	1.4m	Topsoil	
	1.4m	4.5m	Clayey Silt to Silt, Trace Sand & Gravel, Occasional Boulders and wet Sand layers Brown (Glacial Till) appeared Compact	
	4.5m	6.0m	Silt, Trace Sand & Clay Brown, appeared Dense	
6	0	0.9m	Fine to Medium Sand (Pavement Structure)	Dry (minor seepage at 5.3 m)
	0.9m	1.1m	Topsoil, Dark Grey	
	1.1m	2.7m	Silt, Trace to Some Clay Some Sand, Trace Gravel Brown, appeared Dense (Glacial Till)	
	2.7m	5.4m	Clayey Silt, Some Sand Trace Gravel, appeared Very Stiff to Hard (Glacial Till) Brown, Grey below 5.1 m w- 18%, w <sub>L</sub> - 23%, w <sub>P</sub> - 14% GSD : Gr- 2%, Sa- 21% Si- 55%, Cl- 22%	
7	0	0.6m	Fine to Medium Sand (Pavement Structure)	Dry
	0.6m	2.0m	Silt, Trace Sand & Clay Brown	

Table 1 .../cont'd  
BOREHOLE LOGS

7	2.0m	3.0m	Silt, Trace Clay & Sand, Brown appeared Dense (Glacial Till) w- 12.5%, w <sub>L</sub> - 16%, w <sub>P</sub> - 14% GSD : Gr- 0%, Sa- 24% Si- 63%, Cl- 13%	
	3.0m	4.5m	Sandy Silt, Trace Gravel Brown, appeared Dense to Very Dense, Some Sand layers	
8	0	1.8m	Fine to Medium Sand (Pavement Structure)	No Free Water
	1.8m	3.0m	Silty Clay to Clayey Silt Brown & Grey, Trace Organics and Gravel, Some Sand (Fill)	
	3.0m	3.3m	Clayey Silt, Some Sand, Trace Gravel (Glacial Till)	
	3.3m	4.5m	Silt, Grey to Greenish Grey Some Organic Inclusions, Wet	
	4.5m	5.7m	Silty Clay, Greenish Grey and Brown w- 21%, w <sub>L</sub> -27%, w <sub>P</sub> - 15% GSD : Gr- 0%, Sa- 19% Si- 48%, Cl- 33%	
	5.7m	6.0m	Silt, Trace Clay, Wet Greenish Grey	
9	0	0.7m	Fine to Medium Sand (Pavement Structure)	Dry
	0.7m	2.9m	Clayey Silt to Silty Clay Brown & Greenish Grey, Some Organics & Gravel (Fill)	
	2.9m	3.7m	Clayey Silt, Some Sand and Organics, Dark Grey, appeared Soft (Fill) w- 27.5%, w <sub>L</sub> - 33%, w <sub>P</sub> - 19% GSD : Gr- 0%, Sa- 12% Si- 67%, Cl- 21%	

Table 1 .../cont'd  
BOREHOLE LOGS

9	3.7m	6.0m	Silty Clay, Grey & Brown
---	------	------	--------------------------

appeared Soft to Firm and  
becoming Firm to Stiff  
below 4.7 m

w- 19%, w<sub>L</sub>-36%, w<sub>P</sub>-16%

GSD : Gr- 0%, Sa- 11%

Si- 37%, Cl- 52%

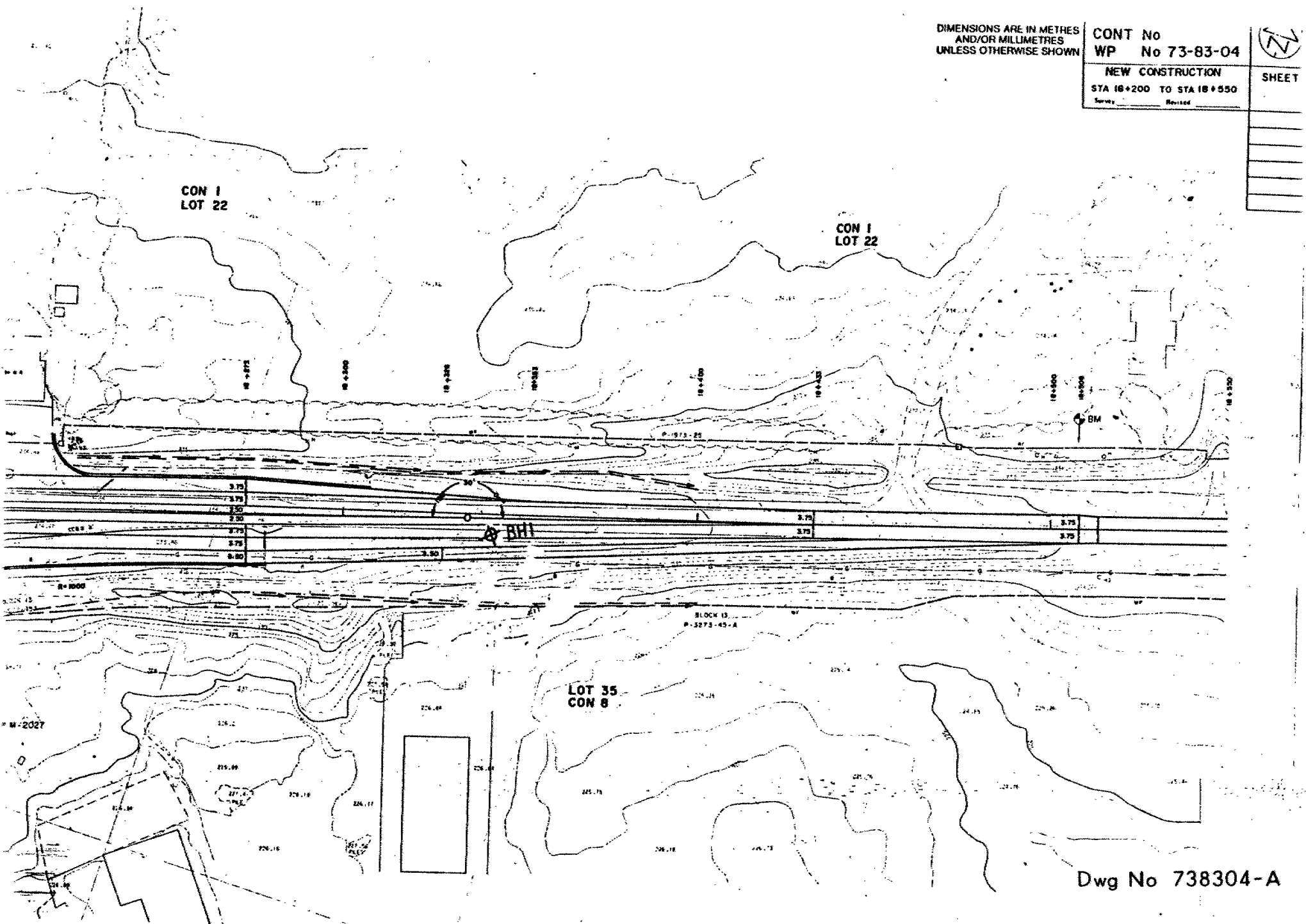
10	0	0.5m	Fine to Medium Sand with Gravel (Pavement Structure) Silty Sand, Trace Gravel Occasional Cobbles, Brown appeared Very Dense (Glacial Till)	Dry
	0.5m	2.4m		
11	0	3.2m	Silty Fine Sand, Trace Gravel and Organics, Brown (Fill) Fine Sand, Some Silt, Trace Gravel, Light Brown Silty Sand, Trace Gravel and Organics, Brown w- 11%, GSD : Gr- 1%, Sa- 82% Si- 16%, Cl- 1%	Dry
	3.2m	4.2m		
	4.2m	6.0m		

DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN

CONT No  
WP No 73-83-04

NEW CONSTRUCTION  
STA 18+200 TO STA 18+550  
Survey Revised

SHEET



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

PLATE No 74-9/40-0  
**CONT No**  
**WP No 73-83-04**

**NEW CONSTRUCTION**  
 STA 17+850 TO STA 18+200  
 Survey FEB 80 Revised



SHEET

CON 1  
 LOT 21

CON 1-  
 LOT 22

LOT 35  
 CON 9

LOT 35  
 CON 8

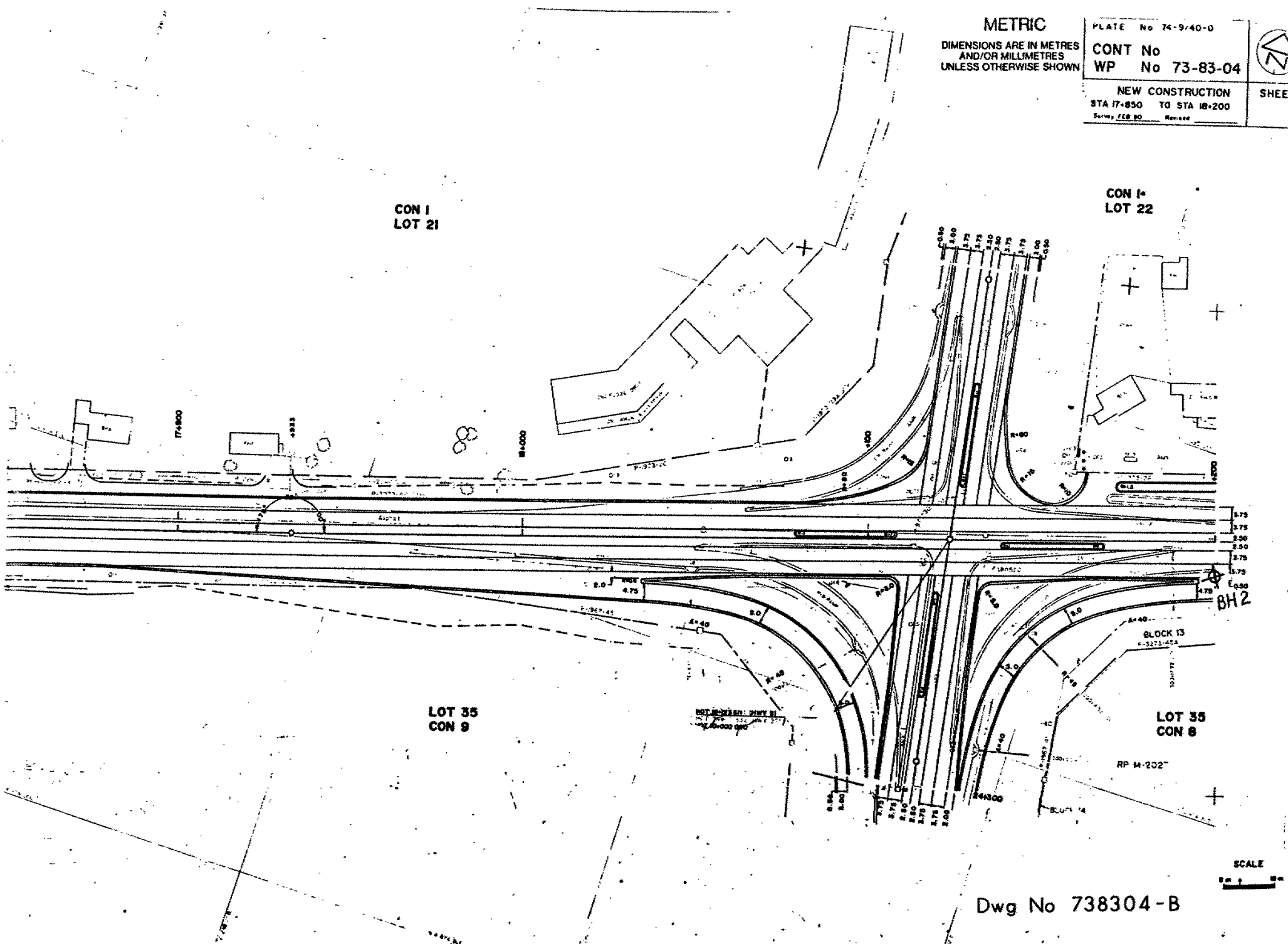
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RP M-202

BH2

SCALE  
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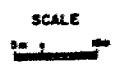
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**SHEET**

Dwg No 738304 -C



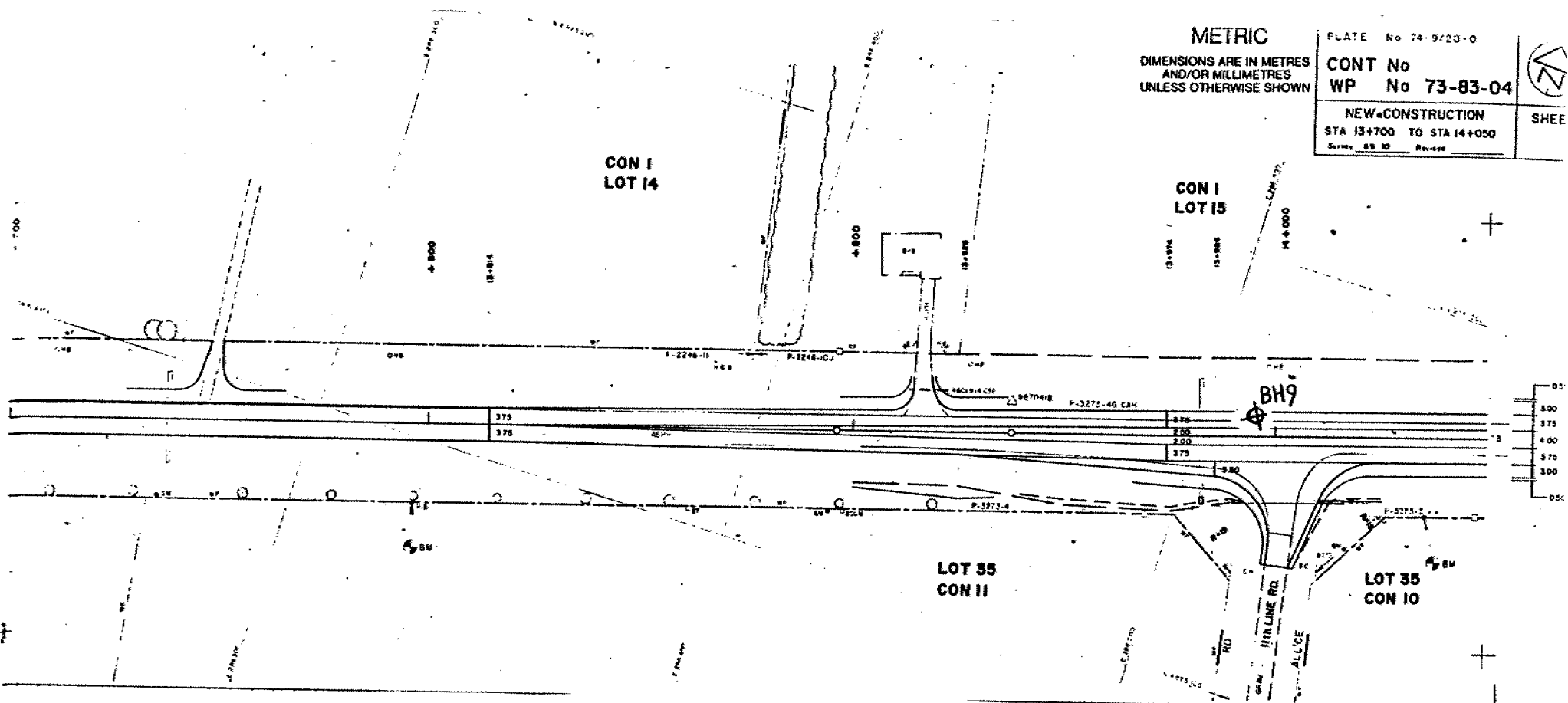
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AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN**

CONT No  
WP No 73-83-04

NEW CONSTRUCTION  
STA 13+700 TO STA 14+050  
Survey 88 10 Revised

**SHEE**



Dwg No 738304-F

# METRIC

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AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN

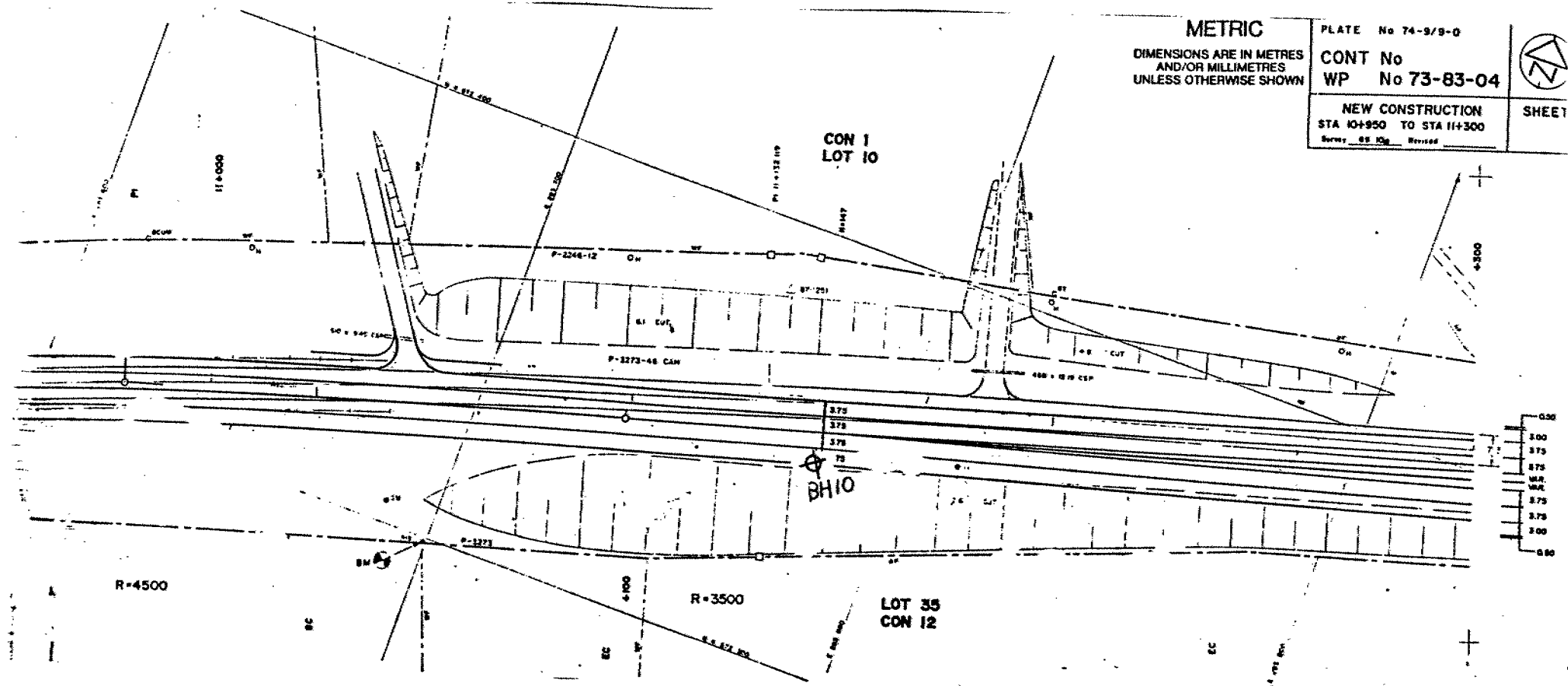
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CONT No  
WP No 73-83-04

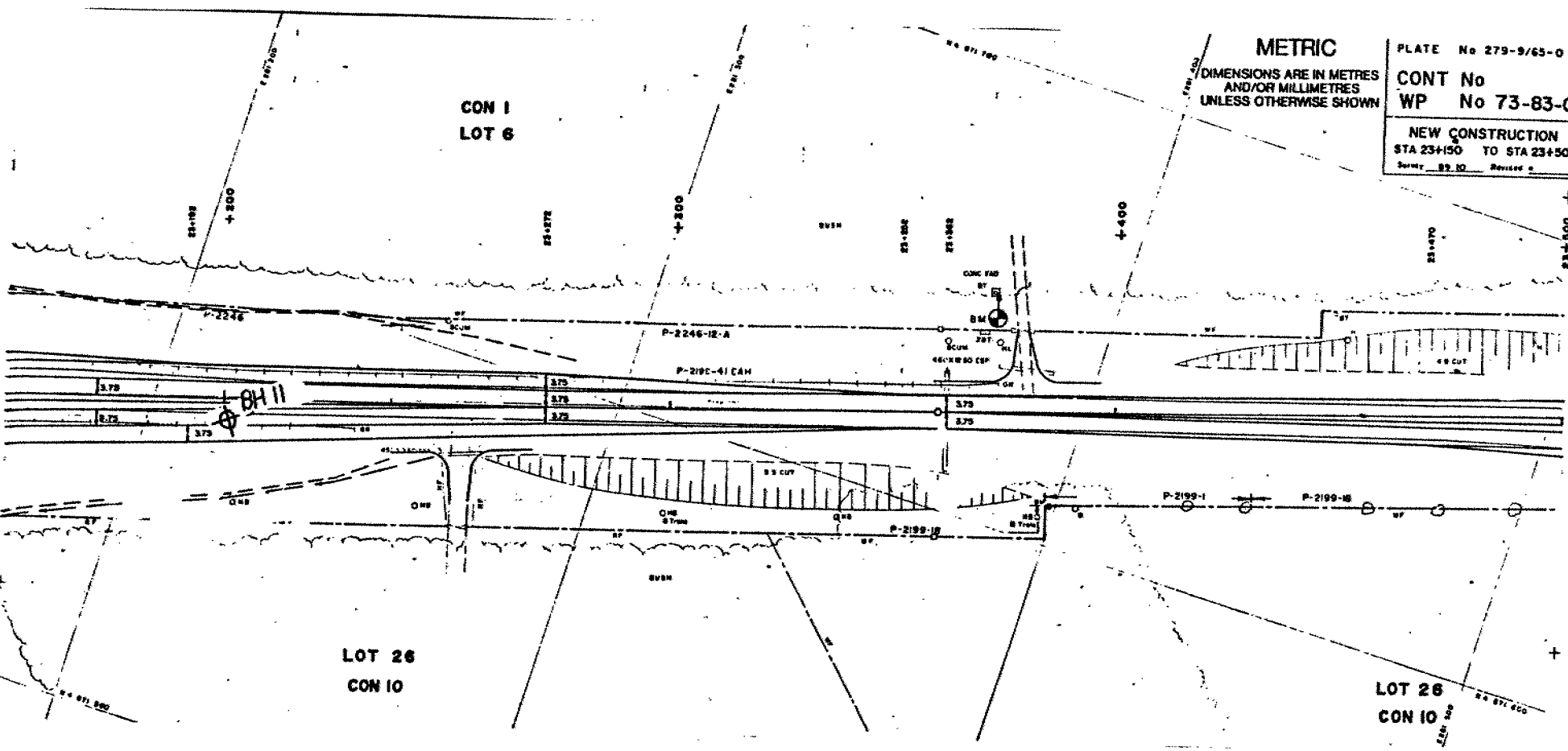
NEW CONSTRUCTION  
STA 10+950 TO STA 11+300  
Survey 65 10g Revised



SHEET



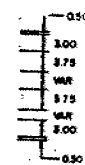
Dwg No 738304-G



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

PLATE No 279-9/65-0  
**CONT No**  
**WP No 73-83-04**  
**NEW CONSTRUCTION**  
STA 23+150 TO STA 23+500  
Survey 89.10 Revised 0

SHEET



Dwg No 738304-H

SEND  
TONICK GARLAND  
STRUCTURAL

FROM

D. EMERY

DEPT.

HWY ENG

DATE

96/02/01

SUBJECT

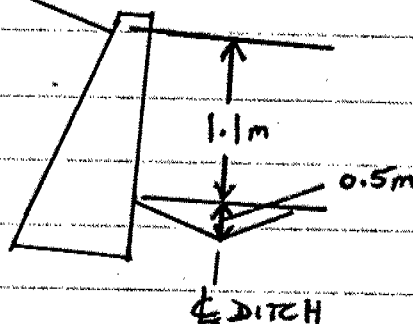
WP 73-83-04

, HWY 9.

AS PER OUR DISCUSSION, IT IS UNDERSTOOD THAT WE ARE TO USE OPSD 4066.01 FOR THE DESIGN OF THE TOE WALL LOCATED AT 23+150 RT HWY 9. THEREFORE, NO DESIGN IS REQUIRED FROM YOU OR THE FOUNDATION SECTION. THE MAXIMUM HEIGHT WILL BE 1.1m TO O.G. OR 1.6m TO THE BOTTOM OF DITCH AS SHOWN BELOW.

REPLY

2:1



C.C. T. SANGIULIANO - FOUNDATIONS  
N. WONG.

REPLY FROM

REPLY DATE

# MEMORANDUM



To: D. Emery  
Highway Engineering  
4th Floor, Atrium Tower

Date: 1995 05 11

From: Pavements and Foundations Office  
Room 315, Central Bldg.

Tel: 235-3731  
Fax: 235-5240

Re: Final Engineering Review Meeting  
Hwy 9 from Hwy 27 Westerly to Simcoe County Rd 10  
WP 73-83-04  
District 6, Toronto

We have reviewed the drawings submitted to our office for the Hwy 9 widening project between Hwy 27 and Simcoe Rd. 10 and have found that the applicable excavation cut slopes and any embankment fill slopes have been designed in conformance with our recommendations. It was observed, however, that a retaining wall is to be constructed between Stations 23+123 to 23+165. Please confirm that this wall was designed as a standard toe retaining wall.

If you have any questions regarding these comments, please do not hesitate to contact this office.

A handwritten signature in black ink, appearing to read "T. Sangiuliano".

T. Sangiuliano, P. Eng.  
Foundation Engineer

for

D. Dundas, P. Eng.  
Sr. Foundation Engineer



# memorandum



To: G. Cautillo  
Head of Geotechnical Section  
Central Region  
Attention : K. Hadipour

Date: 92 04 10

From : Foundation Design Section  
Room 315, Central Building

Re : Highway 9 - Road Widening  
W.P. 73-83-04  
District 6, Toronto

We refer to our memorandum dated 92 03 12, which provides preliminary recommendations for certain areas of the project. The field investigation has now been completed and additional cross-section data has been received from Planning & Design Section.

Based on the available information and site observations, we are pleased to provide the following recommendations intended to be sufficient for design to proceed. Laboratory testing is being carried out on selected soil samples retrieved during the field investigation. When the test results are available, a final foundation investigation report will be prepared and forwarded to you.

1. In general, fill and cut slopes constructed to a slope of 2H:1V or flatter are acceptable. For fill slopes higher than 8 m, a 2m wide mid-height berm should be provided for internal stability.
2. All topsoil and organic material should be removed prior to placement of fill.
3. Adequate slope drainage and protection from erosion should be provided for the new slopes.
4. The existing embankment slopes should be properly benched prior to receiving new fills. In general, all earthwork should be carried out in accordance with MTO Standards and Practices.

We believe the above is sufficient for your present purposes. Should you require further information, please contact our office.

A handwritten signature in black ink, appearing to be 'D. Kwok', written in a cursive style.

D. Kwok, P.Eng.  
Project Foundation Engineer  
for  
B. Iyer, P.Eng.  
Senior Foundation Engineer

c.c. A. Staszak, Planning & Design  
Central Region

~~11 th Line Rd. 10+000 = 14+000 Hwy. 9~~~~10+600 3.6 m Rt. C.L.~~

0	- 60	mm asph.
60	- 320	mm cr.gr.
320	- 600	mm sa.SP.
600	- 1.5	m br.sa.cl.

~~Simcoe Rd. 55 10+000 = 14+500 Hwy. 9~~~~9+400 3.4 m Rt. C.L.~~

0	- 40	mm asph.
40	- 300	mm cr.gr.
300	- 600	mm sa.SP.
600	- 1.5	m br.sa.si.

~~Tecumseth Rd. 17 10+000 = 15+750 Hwy. 9~~~~9+400 4.5 m Lt. C.L.~~

0	- 90	mm cr.gr.
90	- 500	mm sa.SP.
500	- 1.5	m br.si.cl.MP.

~~10 th Line Rd. 10+000 = 16+050 Hwy. 9~~~~10+750 3.0 m Lt. C.L.~~

0	- 50	mm asph.
50	- 250	mm cr.gr.
250	- 730	mm sa.SP.
730	- 1.5	m br.si.sa.stny.

## SIDE ROADS

~~Burnell St. 10+000 = 16+727 Hwy. 9~~~~9+250 3.4 m Lt. C.L.~~

0	- 30	mm asph.
30	- 150	mm cr.gr.
150	- 300	mm br.si.sa.
300	- 600	mm br.si.gr.
600	- 1.5	m br.si.cl.MP.moist.

~~Tecumseth Rd. 20 10+000 = 17+556 Hwy. 9~~~~9+100 2.9 m Lt. C.L.~~

0	- 60	mm asph.
60	- 260	mm cr.gr.
260	- 500	mm sa.SP.
500	- 1.5	m br.si.cl.MP.moist.

~~9+850 5.5 m Rt. C.L. (NEW)~~

0	- 150	mm dk.br.si.sa.tps.
150	- 550	mm br.si.w/s cl.
550	- 700	mm br.sa.si.tr.cl.
700	- 1.1	m br.si.w/s cl.
1.1	- 2.1	m br.si.gr.GW.
2.1	- 2.6	m br.si.cl.HP.- cl.si.

~~9+875 1.5 m Lt. C.L. (NEW)~~

0	- 300	mm dk.br.sa.si.tps.
300	- 720	mm br.si.w/s cl.
720	- 1.2	m br.si.w/s gr.
1.2	- 2.1	m br.cl.si.- si.cl.MP.

## Tecumseth Rd. 20 (Cont'd)

## 9+850 5.5 m Rt. C.L. (NEW)

0 - 150 mm dk.br.si.sa.tps.  
 150 - 550 mm br.si.w/s cl.  
 550 - 700 mm br.sa.si.tr.C.L.  
 700 - 1.1 m br.si.w/s cl.  
 1.1 - 2.1 m br.si.gr.GW.  
 2.1 - 2.6 m br.si.- cl.HP.cl.- si.

## 9+850 8.0 m Lt. C.L. (NEW)

0 - 180 mm dk.br.sa.si.tps.  
 180 - 430 mm br.si.sa.- sa.si.  
 430 - 1.3 m br.si.sa.  
 1.3 - 2.0 m br.si.w/s sa.

## 9+875 1.5 m Lt. C.L. (NEW)

0 - 300 mm dk.br.sa.si.tps.  
 300 - 720 mm br.si.w/s cl.  
 720 - 1.2 m br.si.w/s cl.  
 1.2 - 2.1 m br.cl.si.- cl.si.HP.

## 9+875 3.5 m Lt. C.L. (NEW)

0 - 300 mm dk.br.sa.si.tps.  
 300 - 1.0 m br.si.w/s sa.cl.  
 1.0 - 1.2 m br.si.tr.sa.  
 1.2 - 2.6 m br.si.- cl.HP.cl.- si.

## 9+900 C.L. (NEW)

0 - 100 mm gry.si.cl.tps.  
 100 - 300 mm gry.si.cl.MP.  
 300 - 1.3 m gry.cl.si.-si.cl.  
 1.3 - 1.35 m br.org.si.

## 9+900 6.0 m Rt. C.L. (NEW)

0 - 100 mm gry.si.cl.tps.  
 100 - 1.2 m gry.cl.si.  
 1.2 - 1.3 m br.org.si.

## 9+925 C.L. (NEW)

0 - 100 mm gry.cl.si.tps.  
 100 - 1.2 m gry.cl.si.

## 9+950 C.L. (NEW)

0 - 350 mm dk.br.cl.si.tps.  
 350 - 600 mm gry.cl.si.moist.  
 600 - 700 mm br.sa.SP.wet.  
 700 - 1.2 m br.org.si.

## 9+950 6.5 m Rt. C.L. (NEW)

0 - 100 mm br.cl.si.tps.  
 100 - 350 mm gry.sa.org.fib.wet.  
 350 - 3.3 m gry.si.cl.- cl.si.wet+soft.  
 tr.blk.org.1.2-1.3m  
 3.3 - 3.4 m gry.cl.si.moist.+ firm.  
 (Note: hole filled w. water.+ auger  
 could be pushed thru. wet clay.)  
 sample(93-WA-113) taken 1.3-1.6m.

10+000 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 850 mm sa. S.P.  
 850 - 1.5 m br.si.cl. S.P.

10+008 8.6 m Rt. of C.L.

0 - 460 mm cr.gr.  
 460 - 700 mm sa. S.P.  
 700 - 1.5 m br.si.sa. moist

10+015 4.0 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 150 mm cr.gr.  
 150 - 700 mm sa. S.P.  
 700 - 1.5 m br.si.sa.

10+015 6.0 m Rt. of C.L.

0 - 60 mm cr.gr.  
 60 - 400 mm sa. S.P.  
 400 - 1.5 m br.si.sa. moist

10+015 12.0 m Rt. of C.L.

0 - 70 mm dk.br.si.sa.tps.  
 70 - 1.2 m br.si.sa. dry + stny.

10+030 3.8 m Rt. of C.L.

0 - 70 mm asph.  
 70 - 150 mm cr.gr.  
 150 - 600 mm sa. S.P.  
 600 - 1.5 m br.si.sa.

## HIGHWAY 27

10+061 3.6 m Lt. of C.L.

0 - 120 mm asph.  
 120 - 300 mm cr.gr.  
 300 - 800 mm sa. S.P.  
 800 - 1.5 m br.si.sa.

10+091 3.8 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 250 mm cr.gr.  
 250 - 600 mm sa. S.P.  
 600 - 1.5 m br.si.sa.

10+091 5.9 m Rt. of C.L.

0 - 130 mm cr.gr.  
 130 - 400 mm sa. S.P.  
 400 - 1.4 m br.si.sa.

10+122 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 270 mm cr.gr.  
 270 - 600 mm sa. S.P.  
 600 - 1.5 m br.si.sa.

10+122 12.0 m Rt. of C.L.

0 - 70 mm dk.br.sa.si.tps.  
 70 - 520 mm br.sa.si. moist  
 520 - 1.2 m br.cl.si.-si.cl. L.P. moist

10+147 17.0 m Lt. of C.L. (C.S.P.)

0 - 120 mm dk.br.si.sa.tps.  
 120 - 1.2 m br.si.sa. moist

10+147 15.0 m Rt. of C.L. (C.S.P.)

0 - 120 mm dk.br.si.sa.tps.  
 120 - 1.2 m br.si.sa.tr. of cl. dry  
 occ.stn.

10+152 3.7 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 260 mm cr.gr.  
 260 - 700 mm sa. S.P.  
 700 - 1.5 m br.si.sa.

10+183 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 260 mm cr.gr.  
 260 - 650 mm sa. S.P.  
 650 - 1.5 m br.si.sa.

10+213 3.7 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 270 mm cr.gr.  
 270 - 600 mm sa. S.P.  
 600 - 1.5 m br.sa.si.

10+213 5.7 m Rt. of C.L.

0 - 150 mm cr.gr.  
 150 - 500 mm sa. S.P.  
 500 - 1.5 m br.sa.si.

10+244 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 280 mm cr.gr.  
 280 - 600 mm sa. S.P.  
 600 - 820 mm br.si.sa.  
 820 - 1.5 m br.sa.si.

10+244 12.0 m Rt. of C.L.

0 - 60 mm dk.br.sa.si.tps.  
 60 - 1.2 m br.sa.si. dry - moist

10+274 3.7 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 280 mm cr.gr.  
 280 - 700 mm sa. S.P.  
 700 - 1.5 m br.si.sa.

10+305 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 700 mm sa. S.P.  
 700 - 1.5 m br.si.sa.

10+335 3.7 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 800 mm sa. S.P.  
 800 - 1.5 m br.si.sa.

10+335 3.7 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 700 mm sa. S.P.  
 700 - 1.5 m br.si.sa.

10+335 5.7 m Rt. of C.L.

0 - 150 mm cr.gr.  
 150 - 650 mm sa. S.P.  
 650 - 1.5 m br.si.sa.

10+366 3.6 m Lt. of C.L.

0 - 130 mm asph.  
 130 - 280 mm cr.gr.  
 280 - 750 mm sa. S.P.  
 750 - 1.5 m br.sa.si.

10+366 12.0 m Rt. of C.L.

0 - 60 mm dk.br.si.sa.tps.  
 60 - 1.2 m br.si.sa. moist

10+427 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 750 mm sa. S.P.  
 750 - 1.5 m br.sa.si.

10+457 3.7 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 800 mm sa. S.P.  
 800 - 1.5 m br.si.sa.

10+457 5.7 m Rt. of C.L.

0 - 150 mm cr.gr.  
 150 - 600 mm sa. S.P.  
 600 - 1.5 m br.si.sa.

10+488 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 230 mm cr.gr.  
 230 - 900 mm sa. S.P.  
 900 - 1.5 m br.sa.si.

10+488 5.6 m Lt. of C.L.

0 - 80 mm cr.gr.  
 80 - 600 mm sa. S.P.  
 600 - 900 mm br.si.sa.  
 900 - 1.5 m br.sa.si.

test (89-WB-48) H,M,P,Pi

10+488 12.0 m Rt. of C.L.

0 - 70 mm dk.br.si.sa.tps.  
 70 - 1.2 m br.si.sa.-sa.si.

10+518 3.7 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 250 mm cr.gr.  
 250 - 750 mm sa. S.P.  
 750 - 1.5 m br.si.sa.

10+549 3.6 m Lt. of C.L.

0 - 260 mm asph.  
 260 - 730 mm cr.gr.  
 730 - 1.5 m br.sa.si.

10+853 12.0 m Rt. of C.L.

0 - 70 mm dk.br.si.sa.tps.  
 70 - 1.2 m br.si.sa. dry + stny.

10+884 13.0 m Lt. of C.L.

0 - 190 mm dk.br.sa.si.tps.  
 190 - 1.2 m br.sa.si.-si.sa. moist

10+884 3.7 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 350 mm cr.gr.  
 350 - 800 mm sa. S.P.  
 800 - 1.4 m br.si.gr.

10+914 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 600 mm sa. S.P.  
 600 - 1.5 m br.si.sa.

10+914 5.5 m Lt. of C.L.

0 - 300 mm cr.gr.  
 300 - 700 mm sa. S.P.  
 700 - 1.5 m br.si.sa.

10+936 30.0 m Lt. of C.L. (CONC.CULV)

0 - 90 mm dk.br.sa.si.tps.  
 90 - 1.2 m br.sa.si. moist

10+936 27.0 m Rt. of C.L. (CONC.CULV)

0 - 80 mm dk.br.sa.si.tps.  
 80 - 1.2 m br.sa.si. dry + stny.

## HIGHWAY 27

10+945 3.7 m Rt. of C.L.

0 - 130 mm asph.  
 130 - 450 mm cr.gr.  
 450 - 1.0 m sa. S.P.  
 1.0 - 1.5 br.si.sa.

10+945 5.5 m Rt. of C.L.

0 - 300 mm cr.gr.  
 300 - 800 mm sa. S.P.  
 800 - 1.4 m br.si.sa.

10+975 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 270 mm cr.gr.  
 270 - 800 mm sa. S.P.  
 800 - 1.5 m br.si.sa.

10+975 12.0 m Rt. of C.L.

0 - 40 mm dk.br.si.sa.tps.  
 40 - 1.2 m br.si.sa. dry + stny.

11+006 13.0 m Lt. of C.L.

0 - 80 mm dk.br.si.sa.tps.  
 80 - 1.2 m br.si.sa. moist

11+006 3.7 m Rt. of C.L.

0 - 120 mm asph.  
 120 - 330 mm cr.gr.  
 330 - 700 mm sa. S.P.  
 700 - 1.5 m br.si.sa.



11+036 3.6 m Lt. of C.L.

0 - 90 mm asph.  
 90 - 300 mm cr.gr.  
 300 - 770 mm sa. S.P.  
 770 - 1.5 m br.si.sa.

11+036 5.6 m Lt. of C.L.

0 - 230 mm cr.gr.  
 230 - 850 mm sa. S.P.  
 850 - 1.4 m br.si.sa.

11+067 3.7 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 850 mm sa. S.P.  
 850 - 1.5 m br.si.sa.

11+067 5.7 m Rt. of C.L.

0 - 100 mm cr.gr.  
 100 - 1.5 m br.si.sa.

11+097 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 250 mm cr.gr.  
 250 - 700 mm sa. S.P.  
 700 - 1.5 m br.si.sa.  
 test (89-WB-47) H,M,P

11+097 12.0 m Rt. of C.L.

0 - 50 mm dk.br.si.sa.tps.  
 50 - 1.2 m br.si.sa.-sa.si. dry + stny.

## HIGHWAY 27

11+128 13.0 m Lt. of C.L.

0 - 60 mm dk.br.si.sa.tps.  
 60 - 450 mm br.si.sa. dry + stny.  
 450 N.F.P. stns.

11+128 3.7 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 250 mm cr.gr.  
 250 - 700 mm sa. S.P.  
 700 - 1.5 m br.si.sa.

11+158 3.6 m Lt. of C.L.

0 - 80 mm asph.  
 80 - 240 mm cr.gr.  
 240 - 700 mm sa. S.P.  
 700 - 1.5 m br.si.sa.

11+158 5.6 m Lt. of C.L.

0 - 50 mm cr.gr.  
 50 - 550 mm sa. S.P.  
 550 - 1.4 m br.si.sa.

11+189 3.7 m Rt. of C.L.

0 - 80 mm asph.  
 80 - 200 mm cr.gr.  
 200 - 700 mm sa. S.P.  
 700 - 1.5 m br.si.sa.

11+189 5.7 m Rt. of C.L.

0 - 150 mm cr.gr.  
 150 - 500 mm sa. S.P.  
 500 - 1.5 m br.si.sa.

11+219 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 680 mm sa. S.P.  
 680 - 1.5 m br.si.sa.

11+219 12.0 m Rt. of C.L.

0 - 70 mm dk.br.si.sa.tps.  
 70 - 1.2 m br.si.sa. dry + stny. fine

11+250 13.0 m Lt. of C.L.

0 - 40 mm dk.br.sa.si.tps.  
 40 - 1.2 m br.sa. si.-si.sa. moist  
 occ.stn.

11+250 3.7 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 200 mm cr.gr.  
 200 - 700 mm sa. S.P.  
 700 - 1.5 m br.si.sa.

11+280 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 270 mm cr.gr.  
 270 - 800 mm sa. S.P.  
 800 - 1.5 m br.sa.cl.

11+280 5.6 m Lt. of C.L.

0 - 180 mm cr.gr.  
 180 - 700 mm sa. S.P.  
 700 - 1.4 m br.sa.cl.

## HIGHWAY 27

11+311 3.7 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 640 mm sa. S.P.  
 640 - 1.5 m br.si.sa.

11+311 5.9 m Rt. of C.L.

0 - 200 mm cr.gr.  
 200 - 500 mm sa. S.P.  
 500 - 1.5 m br.si.sa.

11+341 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 250 mm cr.gr.  
 250 - 700 mm sa. S.P.  
 700 - 1.5 m br.sa.cl.

11+341 12.0 m Rt. of C.L.

0 - 80 mm dk.br.si.sa.tps.  
 80 - 1.2 m br.si.sa. dry + stny. fine

11+372 13.0 m Lt. of C.L.

0 - 100 mm dk.br.si.sa.tps.  
 100 - 1.2 m br.sa. si.-si.sa. moist

11+372 3.7 m Rt. of C.L.

0 - 100 mm asph.  
 100 - 200 mm cr.gr.  
 200 - 600 mm sa. S.P.  
 600 - 1.5 m br.si.sa.

13+739 13.0 m Rt. of C.L. (C.S.P.)

0 - 70 mm dk.br.si.cl.tps.  
 70 - 1.2 m br.si.cl. M.P. moist

13+749 3.6 m Lt. of C.L.

0 - 70 mm asph.  
 70 - 270 mm cr.gr.  
 270 - 800 mm sa. S.P.  
 800 - 1.1 m br.si.sa.  
 1.1 - 1.5 dk.br.si.cl.tps.  
 1.5 - 1.7 br.si.cl.

13+810 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 250 mm cr.gr.  
 250 - 800 mm sa. S.P.  
 800 - 1.5 m br.si.cl. M.P.

13+871 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 800 mm sa. S.P.  
 800 - 1.5 m br.si.cl. M.P.

13+871 12.0 m Lt. of C.L.

0 - 100 mm dk.br.si.cl.tps.  
 100 - 1.2 m br.si.cl. M.P. dry

13+932 3.6 m Lt. of C.L.

0 - 80 mm asph.  
 80 - 250 mm cr.gr.  
 250 - 600 mm sa. S.P.  
 600 - 1.1 m br.si.gr.  
 1.1 - 1.2 dk.br.si.sa.tps.  
 1.2 - 1.7 br.si.cl. M.P.

13+983 17.0 m Lt. of C.L. (C.S.P.)

0 - 800 mm br.si.sa. dry (700 mm + moist)  
 800 - 980 mm br.si.cl. + tps. mix  
 980 - 1.2 m gry.si.cl. M.P. moist-wet

13+983 19.0 m Rt. of C.L. (C.S.P.)

0 - 150 mm dk.br.si.cl.tps.  
 150 - 1.2 m br.si.cl. M.P. moist

13+993 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 270 mm cr.gr.  
 270 - 850 mm sa. S.P.  
 850 - 1.1 m br.si.cl. M.P.  
 1.1 - 1.5 br.si.sa. stny.

14+054 3.6 m Lt. of C.L.

0 - 120 mm asph.  
 120 - 300 mm cr.gr.  
 300 - 650 mm sa. S.P.  
 650 - 1.5 m br.si.cl. M.P.

14+115 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 270 mm cr.gr.  
 270 - 660 mm sa. S.P.  
 660 - 1.5 m br.si.cl. M.P.

14+115 12.0 m Lt. of C.L.

0 - 50 mm dk.br.si.sa.tps.  
 50 - 1.2 m br.si.sa. dry

14+176 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 850 mm sa. S.P.  
 850 - 1.5 m br.si.cl. M.P.

14+176 5.6 m Lt. of C.L.

0 - 270 mm cr.gr.  
 270 - 770 mm sa. S.P.  
 770 - 1.4 m br.si.cl. M.P.

14+237 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 270 mm cr.gr.  
 270 - 950 mm sa. S.P.  
 950 - 1.5 m br.si.sa.

14+237 12.0 m Lt. of C.L.

0 - 50 mm dk.br.si.sa.tps.  
 50 - 1.2 m br.si.sa. dry+fine

## HIGHWAY 27

14+298 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 350 mm cr.gr.  
 350 - 900 mm sa. S.P.  
 900 - 1.2 m br.si.cl. M.P.  
 1.2 - 1.5 br.si.sa.

14+359 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 1.0 m br.si.gr.  
 1.0 - 1.5 br.sa.si.

14+359 13.0 m Lt. of C.L.

0 - 40 mm dk.br.si.sa.tps.  
 40 - 1.2 m br.si.sa. dry+fine

14+420 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 950 mm sa. S.P.  
 950 - 1.5 m br.sa.si.

14+480 3.6 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 750 mm sa. S.P.  
 750 - 1.5 m br.sa.si.

test (89-WB-36) taken 1.0-1.5m

W.P. 73-83-04

## HWY. 27 TO ALBION TECUMSETH BOUNDARY

14+480 8.0 m Lt. of C.L.

0 - 50 mm cr.gr.  
 50 - 550 mm br.si.gr.  
 550 - 1.4 m br.sa.si.

14+480 14.0 m Lt. of C.L.

0 - 160 mm dk.br.si.cl.tps.  
 160 - 1.2 m br.si.cl. M.P. dry

14+534 6.4 m Lt. of C.L.

0 - 120 mm asph.  
 120 - 260 mm cr.gr.  
 260 - 1.0 m sa. S.P.  
 1.0 - 1.4 br.sa.si. w/s cl.

14+534 8.4 m Lt. of C.L.

0 - 250 mm cr.gr.  
 250 - 1.4 m sa. S.P.

14+572 4.0 m Lt. of C.L.

0 - 140 mm asph.  
 140 - 350 mm cr.gr.  
 350 - 1.0 m sa. S.P.  
 1.0 N.F.P. old pavement

14+602 12.0 m Lt. of C.L.

0 - 70 mm dk.br.si.cl.tps.  
 70 - 1.2 m br.si.cl. M.P. dry

## HIGHWAY 27

14+633 3.8 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 300 mm cr.gr.  
 300 - 900 mm sa. S.P.  
 900 - 1.2 m dk.br.sa.cl.tps.  
 1.2 - 1.5 br.si.cl. M.P.

14+633 6.0 m Lt. of C.L.

0 - 260 mm cr.gr.  
 260 - 850 mm sa. S.P.  
 850 - 1.1 m dk.br.sa.cl.tps.  
 1.1 - 1.4 br.si.cl. M.P.

14+694 3.8 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 250 mm cr.gr.  
 250 - 800 mm sa. S.P.  
 800 - 1.2 m br.si.sa.  
 1.2 - 1.6 dk.br.si.sa.tps.  
 1.6 - 1.9 br.si.cl. M.P.

14+724 12.0 m Lt. of C.L.

0 - 200 mm dk.br.sa.si.tps.  
 200 - 1.2 m br.sa.si.-si.sa. moist

14+755 3.8 m Lt. of C.L.

0 - 100 mm asph.  
 100 - 200 mm cr.gr.  
 200 - 900 mm sa. S.P.  
 900 - 1.1 m dk.br.si.sa.tps.  
 1.1 - 1.5 br.sa.si.

14+816 4.3 m Lt. of C.L.

0	- 40	mm asph.
40	- 250	mm cr.gr.
250	- 800	mm sa. S.P.
800	- 1.5	m br.si.sa.

14+816 6.0 m Lt. of C.L.

0	- 230	mm cr.gr.
230	- 800	mm sa. S.P.
800	- 1.4	m br.si.sa.

14+846 12.0 m Lt. of C.L.

0	- 40	mm dk.br.si.cl.tps.
40	- 1.2	m br.si.cl. M.P. dry

14+877 3.7 m Lt. of C.L.

0	- 100	mm asph.
100	- 300	mm cr.gr.
300	- 1.0	m sa. S.P.
1.0	- 1.3	dk.br.si.sa.tps.
1.3	- 1.5	br.si.sa.

14+938 3.7 m Lt. of C.L.

0	- 100	mm asph.
100	- 300	mm cr.gr.
300	- 950	mm sa. S.P.
950	- 1.3	m dk.br.si.sa.tps.
1.3	- 1.5	br.si.sa.

14+968 12.0 m Lt. of C.L.

0	- 60	mm dk.br.si.cl.tps.
60	- 1.2	m br.si.cl. M.P. dry

## HIGHWAY 27

14+999 3.7 m Lt. of C.L.

0	- 80	mm asph.
80	- 300	mm cr.gr.
300	- 700	mm sa. S.P.
700	- 1.0	m br.si.sa.
1.0	- 1.3	dk.br.si.sa.tps.
1.3	- 1.6	br.si.sa.

15+060 3.8 m Lt. of C.L.

0	- 100	mm asph.
100	- 350	mm cr.gr.
350	- 750	mm sa. S.P.
750	- 1.5	m br.si.sa. stny.

15+060 6.6 m Lt. of C.L.

0	- 150	mm cr.gr.
150	- 500	mm sa. S.P.
500	- 800	mm dk.br.si.sa.tps.
800	- 1.4	m br.si.sa.

15+090 13.0 m Lt. of C.L.

0	- 100	mm dk.br.sa.si.tps.
100	- 1.2	m br.sa.si. moist

15+110 3.8 m Lt. of C.L.

0	- 100	mm asph.
100	- 230	mm cr.gr.
230	- 1.1	m sa. S.P.
1.1	- 1.5	br.sa.si. moist

17+833 3.8 m Lt. of C.L.

0 - 170 mm asph.  
 170 - 300 mm cr.gr.  
 300 - 850 mm sa. (S.P.)  
 850 - 1.5 m br.si.cl. M.P. moist

17+833 10.0 m Lt. of C.L.

0 - 60 mm dk.br.si.cl.tps.  
 60 - 1.2 m br.si.cl. M.P. dry + stny.

17+894 3.8 m Lt. of C.L.

0 - 180 mm asph.  
 180 - 300 mm cr.gr.  
 300 - 700 mm br.si.gr.  
 700 - 1.5 m br.sa.si. moist

17+923 10.0 m Lt. of C.L.

0 - 40 mm dk.br.si.cl.tps.  
 40 - 1.2 m br.si.cl. M.P. dry

17+955 3.8 m Lt. of C.L.

0 - 80 mm asph.  
 80 - 280 mm cr.gr.  
 280 - 1.1 m br.si.gr.  
 1.1 - 1.3 dk.br.si.sa.tps.  
 1.3 - 1.5 br.si.sa. moist

17+980 3.7 m Lt. of C.L.

0 - 70 mm asph.  
 70 - 280 mm cr.gr.  
 280 - 1.0 m sa. S.P.  
 1.0 - 1.4 br.si.gr.

18+016 9.5 m Lt. of C.L.

0 - 50 mm dk.br.sa.si.tps.  
 50 - 700 mm br.sa.si. moist  
 700 - 1.2 m br.cl.si. moist