

REMARKS: _____

W.P. 398-97-00

FOUNDATION INVESTIGATION REPORT
FOR
HIGHWAY 169 UNDERPASS
W.P. 290-97-00, SITE 42-320
HIGHWAY 69, DISTRICT 52
HUNTSVILLE, ONTARIO

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Job No. 97TF088A

June, 1998

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FOUNDATION INVESTIGATION REPORT

For

Highway 169 Underpass

W.P. 290-97-00, Site 42-320

Highway 69, District 52, Huntsville

INTRODUCTION

This report summarizes the results of the foundation investigation carried out for construction of the underpass to carry Highway 169 over the proposed four-lane Highway 69 (Station 12+013 Highway 69 chainage).

The report pertains to the proposed bridge structure and approaches within about 20 m of the abutments, between approximate stations 9+940 and 10+060, Highway 169 chainage.

SITE DESCRIPTION

The site is located about 5 km south of MacTier along the existing Highway 69. The proposed interchange will connect the future Highway 169 north (existing Highway 69) with the new four-lane section of Highway 69. At the underpass, the Highway 169 structure will run east-west.

The bridge location is presently a swamp with existing Highway 69 passing through the east part of the bridge area. Bedrock outcrops immediately to the north and some 80 m to the south of the bridge site.

The site is located in the Precambrian Laurentian peneplane. The topography is irregular in detail with many small lakes separated by ridges of Precambrian bedrock. The surface in general is relatively flat. The overburden in the region is typically shallow but can vary substantially in thickness over short distances. Swamp environments have developed in areas of poor drainage.

INVESTIGATION PROCEDURES

The fieldwork was carried out during the period February 17 to 24, 1998 and comprised 10 boreholes drilled at the locations shown on Drawing 1. Three rock probes were subsequently put down along the centre pier to further define the bedrock profile.

The boreholes were drilled to refusal on bedrock/inferred bedrock at depths of 0.2 to 3.1 m, 4.7 to 8.2 m in the vicinity of the south end of the central pier. Three of the boreholes were extended an additional 3.0 to 3.2 m into the bedrock using NQ rock coring equipment.

The boreholes were advanced using continuous flight hollow stem augers, powered by a track-mounted CME-75 drillrig, supplied and operated by a specialist drilling contractor, working under the full-time supervision of a member of our engineering staff.

Where an appreciable overburden thickness was encountered, samples were recovered using a conventional split spoon sampler as well as from the auger cuttings. Standard penetration tests were conducted simultaneously with the sampling operation to assess the strength characteristics of the substrata. The groundwater conditions in the boreholes were closely monitored during the course of the fieldwork.

All of the recovered samples were returned to our laboratory for detailed visual examination, classification and routine moisture content determinations. Samples of the recovered rock core were subjected to unconfined compressive strength tests.

SUMMARIZED SUBSURFACE CONDITIONS

Reference is made to the appended Log of Borehole sheets for details of the subsurface conditions including soil classifications, inferred stratigraphy, standard penetration test "N" values, rock core descriptions, groundwater observations and the results of laboratory moisture content determinations. Stratigraphic profiles prepared from the borehole data are presented on Drawing 1.

The stratigraphy revealed in the boreholes generally comprised a surficial peat deposit overlying bedrock. Topsoil was identified in one borehole; sand layers were encountered in two boreholes. The strata encountered are summarized below.

Peat

Black, fine fibrous peat was encountered surficially in all boreholes except borehole 320-2. The top elevation of the peat ranged from 238.9 (borehole 320-1 and 3) to 239.4 (borehole 320-8). The thickness of the peat deposit ranged from 0.1 to 3.6 m. Moisture contents ranged between 478 to 1000%.

Topsoil

Topsoil was encountered surficially in borehole 320-2. The topsoil layer was 200 mm thick and comprised silty sand judged to have a high organic content.

Sand

A sand deposit was encountered below the peat in boreholes 320-4 and 6 at depths of 0.1 and 3.6 m (elevation 238.8 and 235.5), respectively. The sand was loose and fine to medium/coarse grained. Moisture contents ranged from 11 to 19%. The sand mantled bedrock/inferred bedrock.

Bedrock

Bedrock or inferred bedrock was contacted below the peat, topsoil or sand in all boreholes at depths of 0.2 to 3.1 m (elevation 236.2 to 239.1), and at 7.3 m depth (elevation 231.8) in borehole 320-6 located at the south end of the centre

pier. The depth to and elevation of bedrock inferred in the rock probes at the centre pier were as follows:

Location	Depth to Refusal (m)	Inferred Bedrock Elevation
3.0 m Lt. of C/L Hwy 169	2.5	236.5
3.0 m Rt. of C/L Hwy 169	4.7	234.3
14.1 m Rt. of C/L Hwy 169	8.2	230.8

A description of the rock cores recovered from boreholes 320-4, 5 and 8 is presented on Table I. The bedrock consists of granitic gneiss. Core recovery ranged from 86 to 100% (average 96%) and the RQD ranged from 50 to 100% (average 84%). The rock was described as good to excellent quality, locally fair quality in the upper 740 mm of borehole 380-8.

The unconfined compressive strength of selected core samples were as follows:

Borehole No.	Depth (m)	Unconfined Compressive Strength (MPa)
320-4	2.1 - 2.2	109.8
320-5	2.3 - 2.4	67.8
320-8	6.1 - 6.2	114.5

Groundwater

In general, the boreholes were drilled in a swamp with water levels 0 to 325 mm above the ground surface. Free water was not observed in borehole 320-2 during the course of the fieldwork. Observed water levels are subject to seasonal fluctuations and rainfall patterns.

CLOSURE

The fieldwork was carried out under the supervision of B.Garlick. The equipment was supplied by All-Terrain Drilling Limited.

The report was written by M.R. Anderson, Project Engineer, and reviewed by D.W. Kerr, Manager of Geotechnical and Geo-Environmental Services, Hamilton.



Yours very truly

Peto MacCallum Ltd.

A handwritten signature in black ink, appearing to read "M. Anderson", written over a horizontal line.

Murray R. Anderson, M.Eng., P.Eng.
Project Engineer



A handwritten signature in black ink, appearing to read "D. W. Kerr", written over a horizontal line.

Dennis W. Kerr, M.Eng., P.Eng.
Manager Geotechnical and
Geo-Environmental Services
Hamilton

MRA:mma

TABLE I

ROCK CORE DESCRIPTION
WP 290-97-00, Site No. 42-320

CORE RECOVERY					CORE DESCRIPTION	
BOREHOLE	CORE NO.	DEPTH (m)	RECOVERY (%)	RQD (%)	DEPTH (m)	DESCRIPTION
320-4	2	1.37 - 1.96	96	85	1.37 - 4.42	GRANITIC GNEISS, pink, fine crystalline with biotite mica, high strength, unweathered; wide spaced dipping joints, rough planar, tight; good to excellent quality
	3	1.96 - 3.48	97	97		
	4	3.48 - 4.42	100	100		
320-5	1	0.53 - 0.80	86	0*	0.53 - 2.10	GRANITIC GNEISS, pink, fine crystalline with biotite mica, high strength, unweathered; close to moderate spaced discontinuities; good quality
	2	0.80 - 2.32	98	80	2.10 - 3.75	
	3	2.32 - 3.75	96	93		
320-8	3	3.12 - 3.66	86	71	3.12 - 3.86	GRANITIC GNEISS, pink, fine to coarse crystalline with hornblende, high strength, unweathered; close to moderate spaced discontinuities; fair quality
	4	3.66 - 3.86	100	50	3.86 - 6.17	
	5	3.86 - 5.36	97	80		
	6	5.36 - 6.17	100	100		

RQD = Rock Quality Designation

* Low RQD due to casing disturbance

Logged by J. Wright

LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N', - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 0.3m INTO THE SUBSOIL. DRIVEN BY MEANS OF A 63.5kg HAMMER FALLING FREELY A DISTANCE OF 0.76m.

DYNAMIC PENETRATION RESISTANCE : - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 51mm, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 0.3m INTO THE SUBSOIL. THE DRIVING ENERGY BEING 475 J 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 :-

CONSISTENCY	'N' BLOWS/0.3 m	c kPa	DENSENESS	'N' BLOWS/0.3 m
VERY SOFT	0 - 2	0 - 12	VERY LOOSE	0 - 4
SOFT	2 - 4	12 - 25	LOOSE	4 - 10
FIRM	4 - 8	25 - 50	COMPACT	10 - 30
STIFF	8 - 15	50 - 100	DENSE	30 - 50
VERY STIFF	15 - 30	100 - 200	VERY DENSE	> 50
HARD	> 30	> 200		
W.T.P.L.	WETTER THAN PLASTIC LIMIT		D.T.P.L.	DRIER THAN PLASTIC LIMIT
	A.P.L. ABOUT PLASTIC LIMIT			

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Q _u	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q _{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q _d	DRAINED TRIAXIAL		

▲, Δ - Undisturbed and remoulded shear strength determined from in situ vane test.

■ - Undrained shear strength determined from pocket penetrometer test.

LOG OF BOREHOLE NO. 320-1

N 4 994 663
E 282 263

PROJECT W.P. 290-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Highway 169 Underpass, Site 42-320
LOCATION Station 9+943 (Highway 169) 8.7m Lt.
BORING METHOD Continuous Flight Hollow Stem Augers

OUR PROJECT 97TF088A
ENGINEER M. R. Anderson
TECHNICIAN B. G.

SOIL PROFILE				SAMPLES		SHEAR STRENGTH C_u				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W				GROUNDWATER OBSERVATIONS AND REMARKS	
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	DYNAMIC CONE PENETRATION x STANDARD PENETRATION TEST • BLOWS/0.3M				WATER CONTENT %				
							20	40	60	80	10	20	30		
0	GROUND ELEVATION 238.86														
0.86	PEAT : Black, fine fibrous peat, saturated		238	1	AS									150mm of standing water at surface	
1.5	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 0.86m BEDROCK ASSUMED.														
3.0															
4.5															
6.0															
7.5															
9.0															
10.5															
12.0															
13.5															
15.0															
16.5															

NOTES:

CHECKED BY: *MM*

LOG OF BOREHOLE NO. 320-2

N 4 994 645
E 282 264

PROJECT W.P. 290-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Highway 169 Underpass, Site 42-320
LOCATION Station 9+938 (Highway 169) 8.7m Rt.
BORING METHOD Continuous Flight Hollow Stem Augers

OUR PROJECT 97TF088A
ENGINEER M. R. Anderson
TECHNICIAN B. G.

SOIL PROFILE				SAMPLES			SHEAR STRENGTH C_u ▲				LIQUID LIMIT W_L			GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	DYNAMIC CONE PENETRATION x STANDARD PENETRATION TEST ●				PLASTIC LIMIT W_P			
							BLOWS/0.3M				WATER CONTENT %			
							20	40	60	80	10	20	30	
0	GROUND ELEVATION 239.26		239											
0.20	TOPSOIL : Black silty sand, high organic BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 0.20m BEDROCK ASSUMED.													
1.5													Upon completion of augering, no free water, no cave.	
3.0														
4.5														
6.0														
7.5														
9.0														
10.5														
12.0														
13.5														
15.0														
16.5														

NOTES:


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LOG OF BOREHOLE NO. 320-3

N 4 994 669
E 282 282

PROJECT W.P. 290-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Highway 169 Underpass, Site 42-320
LOCATION Station 9+963 (Highway 169) 8.7m Lt.
BORING METHOD Continuous Flight Hollow Stem Augers

OUR PROJECT 97TF088A
ENGINEER M. R. Anderson
TECHNICIAN B. G.

SOIL PROFILE				SAMPLES			SHEAR STRENGTH C_u				LIQUID LIMIT W_L				GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	DYNAMIC CONE PENETRATION x STANDARD PENETRATION TEST •				PLASTIC LIMIT W_P				
							BLOWS/0.3M				WATER CONTENT %				
							20	40	60	80	10	20	30		
0	GROUND ELEVATION 238.85													125mm of standing water at surface	
0.94	PEAT : Black, fine fibrous peat, saturated		238												
1.5	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 0.94m BEDROCK ASSUMED.		237												

NOTES:

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LOG OF BOREHOLE NO. 320-4 **N 4 994 651**
E 282 283

PROJECT W.P. 290-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE OUR PROJECT 97TF088A
SITE Highway 169 Underpass, Site 42-320
LOCATION Station 9+958 (Highway 169) 8.7m Rt. BORING DATE February 23, 1998 ENGINEER M. R. Anderson
BORING METHOD Continuous Flight Hollow Stem Augers & NQ Rock Coring TECHNICIAN B. G.

SOIL PROFILE				SAMPLES		SHEAR STRENGTH C_u ▲				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	DYNAMIC CONE PENETRATION x STANDARD PENETRATION TEST ●				WATER CONTENT %			
						BLOWS/0.3M				WATER CONTENT %			
						20	40	60	80	10	20	30	
0	GROUND ELEVATION 238.91												150mm of standing water at surface
-0.10	PEAT : Black, fine fibrous peat, saturated		238										
-1.37	SAND : Grey, fine to medium sand, trace of silt, saturated			1	AS								
1.5	BEDROCK : Granitic Gneiss		237	2	RC	590	96	85	100				
				3	RC	1520	97	97	100				
3.0			236										
			235	4	RC	940	100	100	100				
4.42	BOREHOLE TERMINATED AT 4.42m		234			RUN (mm)	RECOVERY (%)	ROD (%)	DRILL WATER RETURN (%)				
4.5													
6.0													
7.5													
9.0													
10.5													
12.0													
13.5													
15.0													
16.5													

NOTES:

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LOG OF BOREHOLE NO. 320-5

N 4 994 683
E 282 319

PROJECT W.P. 290-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE

OUR PROJECT 97TF088A

SITE Highway 169 Underpass, Site 42-320

LOCATION Station 10+002 (Highway 169) 8.7m Lt.

BORING DATE February 23, 1998 ENGINEER M. R. Anderson

BORING METHOD Continuous Flight Hollow Stem Augers & NQ Rock Coring

TECHNICIAN B. G.

SOIL PROFILE				SAMPLES				SHEAR STRENGTH C_u ▲				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P W W_L				GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	DYNAMIC CONE PENETRATION x STANDARD PENETRATION TEST ●				WATER CONTENT %					
							BLOWS/0.3M				WATER CONTENT %					
							20	40	60	80	10	20	30			
0	GROUND ELEVATION 238.95						20	40	60	80					Water at surface	
0.53	PEAT : Black, fine fibrous peat, saturated															
	BEDROCK : Granitic Gneiss		238	1	RC		270	86	0	100						
1.5			237	2	RC		1520	98	80	100						
3.0			236	3	RC		1430	96	93	90						
3.75	BOREHOLE TERMINATED AT 3.75m		235												Slight drill water loss at 3.35m.	
4.5							RUN (mm)	RECOVERY (%)	ROD (%)	DRILL WATER RETURN (%)						
6.0																
7.5																
9.0																
10.5																
12.0																
13.5																
15.0																
16.5																

NOTES:

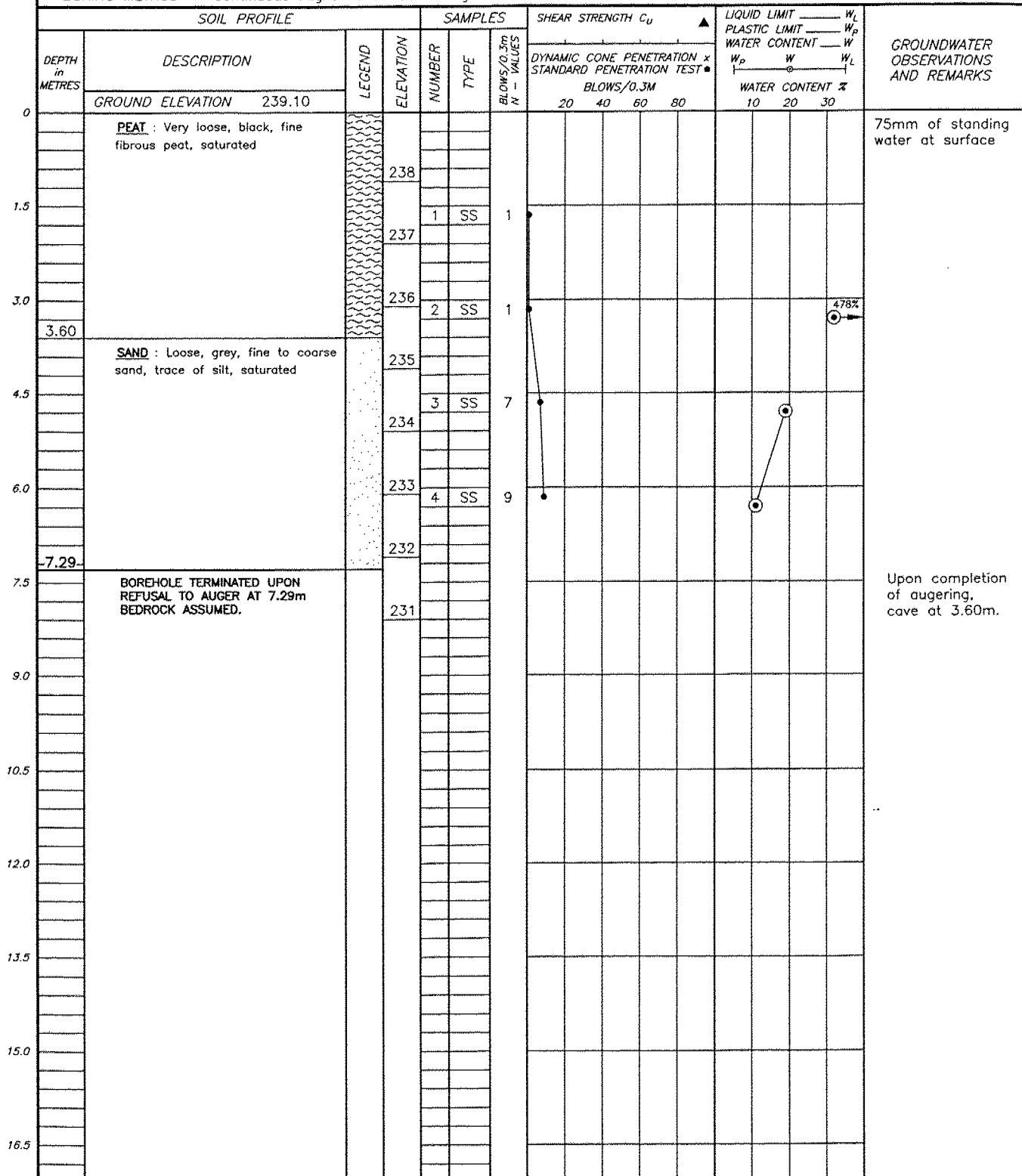
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LOG OF BOREHOLE NO. 320-6

N 4 994 664
E 282 320

PROJECT W.P. 290-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Highway 169 Underpass, Site 42-320
LOCATION Station 9+998 (Highway 169) 8.7m Rt.
BORING METHOD Continuous Flight Hollow Stem Augers

OUR PROJECT 97TF088A
ENGINEER M. R. Anderson
TECHNICIAN B. G.



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LOG OF BOREHOLE NO. 320-7

N 4 994 694
E 282 351

PROJECT W.P. 290-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE

OUR PROJECT 97TF088A

SITE Highway 169 Underpass, Site 42-320

LOCATION Station 10+037 (Highway 169) 8.7m Lt.

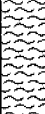

BORING DATE February 17, 1998

ENGINEER M. R. Anderson

BORING METHOD Continuous Flight Hollow Stem Augers

TECHNICIAN

B. G.

SOIL PROFILE				SAMPLES				SHEAR STRENGTH C_u				LIQUID LIMIT W_L				GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	DYNAMIC CONE PENETRATION x STANDARD PENETRATION TEST				PLASTIC LIMIT W_P					
							BLOWS/0.3M				WATER CONTENT %					
							20	40	60	80	10	20	30			
0	GROUND ELEVATION 239.30															
	PEAT : Black, fine fibrous peat, saturated		239													
				1	AS											
1.50			238											595% 		
	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 1.50m BEDROCK ASSUMED.		237													

NOTES:

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LOG OF BOREHOLE NO. 320-8

N 4 994 676
E 282 352

PROJECT W.P. 290-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE

OUR PROJECT 97TF088A

SITE Highway 169 Underpass, Site 42-320

BORING DATE February 17, 1998 ENGINEER M. R. Anderson

LOCATION Station 10+032 (Highway 169) 8.7m Rt.

BORING METHOD Continuous Flight Hollow Stem Augers & NQ Rock Coring

TECHNICIAN B. G.

SOIL PROFILE				SAMPLES		SHEAR STRENGTH C_u ▲				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P W W_L			GROUNDWATER OBSERVATIONS AND REMARKS		
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	DYNAMIC CONE PENETRATION x STANDARD PENETRATION TEST ● BLOWS/0.3M				WATER CONTENT %				
							20 40 60 80				10 20 30				
							0/100mm								
0	GROUND ELEVATION 239.36													Water at surface	
	<u>PEAT</u> : Very loose, black, fine fibrous peat, saturated		239												
			238												
1.5			237	1	SS	1									654% ●→
3.0	<u>BEDROCK</u> : Granitic Gneiss		236	2	SS	0/100mm								Lost drill water at 5.90m.	
				3	RC	540	86	71	100				688% ●→		
				4	RC	200	100	50	100						
4.5			235												
				5	RC		810	97	80	100					
				6	RC		810	100	100	90					
6.0	6.17		233												
	BOREHOLE TERMINATED AT 6.17m														
							RUN (mm)	RECOVERY (%)	ROD (%)	DRILL WATER RETURN (%)					
7.5															
9.0															
10.5															
12.0															
13.5															
15.0															
16.5															

NOTES:



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LOG OF BOREHOLE NO. 320-9

N 4 994 701
E 282 370

PROJECT W.P. 290-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Highway 169 Underpass, Site 42-320
LOCATION Station 10+057 (Highway 169) 8.7m Lt.
BORING METHOD Continuous Flight Solid Stem Augers

OUR PROJECT 97TF088A
BORING DATE February 17, 1998 ENGINEER M. R. Anderson
TECHNICIAN B. G.

SOIL PROFILE				SAMPLES				SHEAR STRENGTH C_u ▲				LIQUID LIMIT W_L — PLASTIC LIMIT W_p — WATER CONTENT W —				GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N — VALUES	DYNAMIC CONE PENETRATION x STANDARD PENETRATION TEST ♦				WATER CONTENT %					
							BLOWS/0.3M				WATER CONTENT %					
							20	40	60	80	10	20	30			
0	GROUND ELEVATION 239.25														200mm of standing water at surface	
	PEAT : Very loose, black, fine fibrous peat, saturated		239													
			238													
1.5			1	SS	0									802%		
2.08			237												Upon completion of augering, cave at 1.30m.	
	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 2.08m BEDROCK ASSUMED.															
3.0																
4.5																
6.0																
7.5																
9.0																
10.5																
12.0																
13.5																
15.0																
16.5																

NOTES:

CHECKED BY: *mmk*

N 4 994 683
E 282 371

OUR PROJECT 97TF088A

BORING DATE February 17, 1998 ENGINEER M. R. Anderson

BORING DATE February 17, 1998 ENGINEER M. R. Anderson

TECHNICIAN B. G.

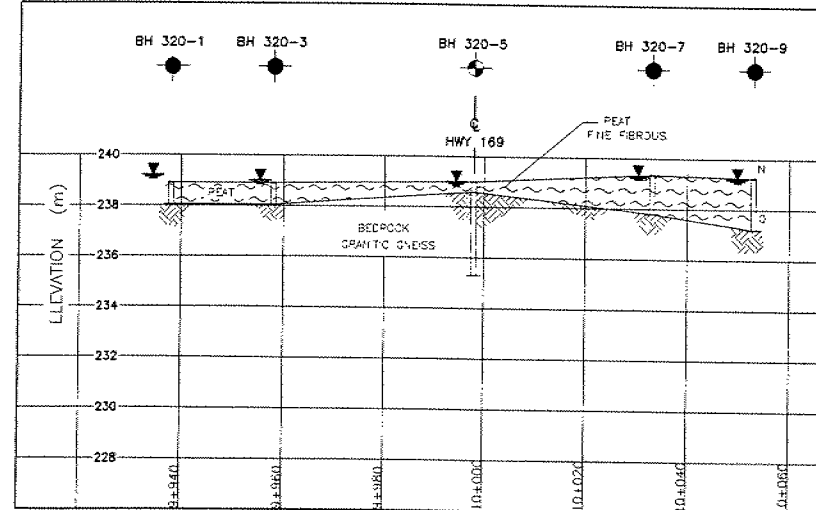
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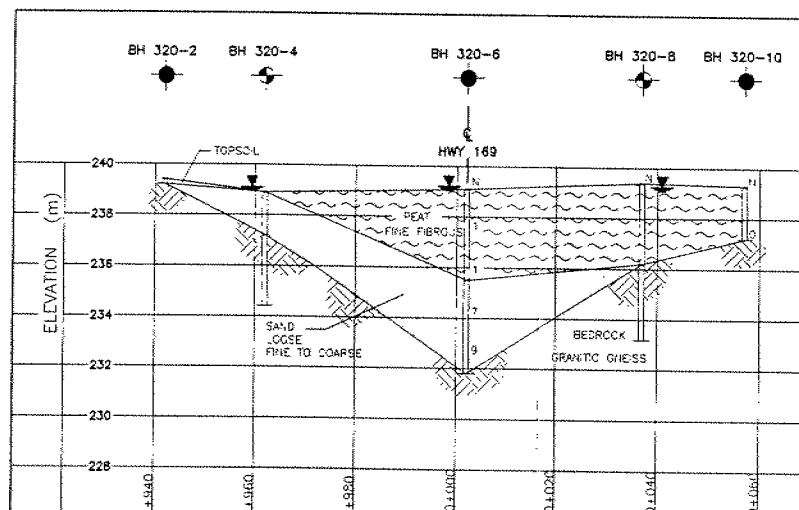


BOREHOLE LOCATION PLAN

SCALE 1:500



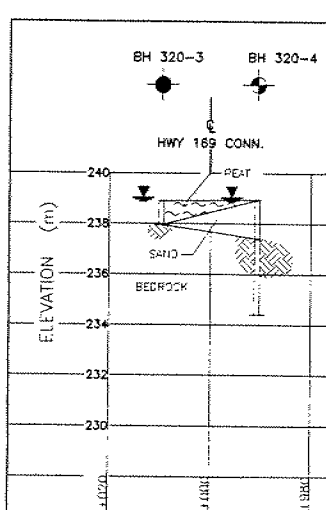
SECTION A-A



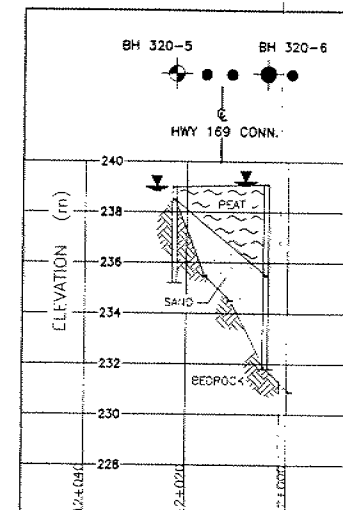
SOIL PROFILES

SCALE: VERTICAL 1:300
HORIZONTAL 1:500

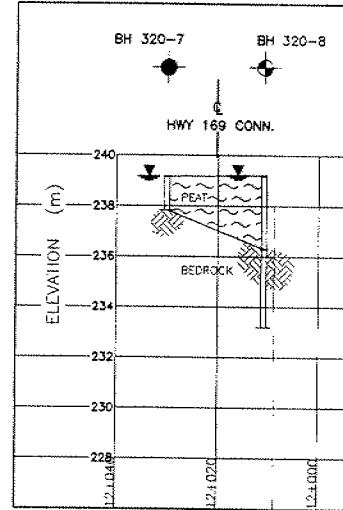
SECTION B-B



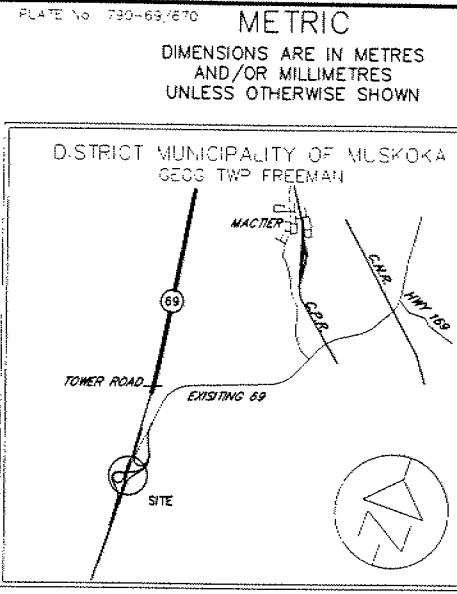
SECTION C-C



SECTION D-D



SECTION E-E



KEY PLAN

0.5 km 1 km

BOREHOLE	LOCATION	ELEVATION
320-1	N 4 994 663 E 282 263	238.86
320-2	N 4 994 645 E 282 264	239.26
320-3	N 4 994 669 E 282 282	238.85
320-4	N 4 994 651 E 282 283	238.91
320-5	N 4 994 683 E 282 319	238.95
320-6	N 4 994 664 E 282 320	239.10
320-7	N 4 994 694 E 282 351	239.30
320-8	N 4 994 676 E 282 352	239.36
320-9	N 4 994 701 E 282 370	239.25
320-10	N 4 994 683 E 282 371	239.28



LEGEND

- BOREHOLE
- BOREHOLE AND ROCK CORE
- POCK PROBE
- OBSERVED WATER LEVEL (DURING OR UPON COMPLETION OF DRILLING)

NOTE

- REFER TO LOG OF BOREHOLE SHEETS FOR DETAILED SURFACE CONDITIONS.
- THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES, THE BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE.

**MINISTRY OF TRANSPORTATION
ENGINEERING AND RIGHT OF WAY OFFICE
SURVEYS AND PLANS SECTION**

**PROPOSED CROSSING
AT
KING'S HIGHWAY 169 CONNECTION
AND
PROPOSED KING'S HIGHWAY 69
DISTRICT MUNICIPALITY OF MUSKOKA
LOT 10 GEOG TWP FREEMAN COM 2 TWP OF GEORGIAN BAY**

SCALE AS SHOWN	DISTRICT 52 HUNTSVILLE	REGION NORTHERN
WP/WO 290-97-00	PROFILE C-790-69-068	PLAN B-790-69-008
SURVEY 97 12	PLAN 97 12	
SITE 42-320	PLAN E-790-69-067	

Peto MacCallum Ltd.
CONSULTING ENGINEERS
AS BURFORD ROAD, HAMILTON, ONTARIO L8E 3C8

DRAWN JS	DATE JUNE 1998	SCALE AS SHOWN	JOB NO. 97TF08BA	DRAWING NO. 1
-------------	-------------------	-------------------	---------------------	------------------

**BOREHOLE LOCATION PLAN
AND SOIL PROFILES**

**FOUNDATION DESIGN REPORT
FOR
HIGHWAY 169 UNDERPASS
W.P. 290-97-00, SITE 42-320
HIGHWAY 69, DISTRICT 52
HUNTSVILLE, ONTARIO**

Distribution:

15 cc: McCormick Rankin Corporation
1 cc: PML Hamilton
1 cc: PML Toronto
1 cc: PML Barrie

Job No. 97TF088A

June, 1998

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FOUNDATION DESIGN REPORT

For

Highway 169 Underpass

W.P. 290-97-00, Site 42-320

Highway 69, District 52, Huntsville

INTRODUCTION

This report provides geotechnical comments and recommendations regarding design and construction of foundations, abutments and approaches at the proposed Highway 69 underpass at Highway 169 north.

Construction of a two span underpass structure is planned. At the underpass location, the proposed four-lane Highway 69 will be constructed approximately 3.0 m above the existing ground surface (road grade at elevation 242). Road grades on Highway 169 over the structure will be near elevation 248, some 10 m above existing grade (based on preliminary grade information (Sheets 2 and 3 of the Environmental Assessment/Route Planning Study, W.P. 529-89-00) and existing ground surface elevations determined at borehole locations).

The subsurface stratigraphy revealed at the bridge site generally comprised a surficial peat deposit overlying bedrock. Topsoil and sand layers were encountered locally. Bedrock/inferred bedrock was contacted at depths of 0.2 to 3.1 m, locally 7.3 m at the south end of the centre pier.

FOUNDATIONS

Integral Abutments on Piles

The preliminary profile drawings indicate that road grades along Highway 169 at the underpass location will be some 10 m above existing grade. Construction of integral abutments supported on steel H-piles driven through the approach fill is therefore considered feasible. The H-piles should be driven to refusal on bedrock anticipated at the following elevations:

Location	Bedrock/Inferred Bedrock Elevation
West Abutment, North End	237.9
West Abutment, South End	237.5
Centre Pier, North End	238.4
Centre Pier, South End	231.8
East Abutment, North End	237.8
East Abutment, South End	236.2

Factored pile capacities at the ultimate limit state for selected pile sections are presented below. The capacities were obtained by applying a geotechnical resistance factor of 0.6 to the factored structural resistance of the pile section. A yield strength of 300 MPa is assumed for the steel.

H-Pile Section	Factored Capacity at ULS (kN)
HP 250 x 62	970
HP 250 x 85	1325
HP 310 x 79	1210
HP 310 x 110	1710
HP 310 x 174	2700

The capacity at serviceability limit states normally allows for 25 mm of compression of the pile and founding medium. Considering the bedrock to be non-yielding and the relatively short pile length required, the design is not expected to be governed by settlement since the loading required to produce deformation of the pile will be much larger than the factored capacity at ULS.

The type of equipment required to drive the piles will be somewhat dictated by the design capacity. In general, the piles should be driven to practical refusal using a hammer which transfers at least 40 Kj of energy to the pile. Since the piles will set on hard rock, a specific set for this project is not provided.

The installation operations should be inspected on a full-time basis by qualified geotechnical personnel to confirm the toe elevation, driving resistance, alignment, plumbness, uniformity of set, and quality of splices.

The pile tip should be reinforced (OPSD 3301) to minimize the potential for damage when setting into bedrock. Rock points should be considered to minimize the potential for sliding of

the pile tip along sloping bedrock surfaces, particularly in view of the greater depth to bedrock indicated locally at the south end of the centre pier.

Pile caps should be provided with the normal 1.6 m of earth cover or equivalent thermal insulation as protection against frost action. A 25 mm thick layer of polystyrene insulation is thermally equivalent to 600 mm of soil cover.

The soil adjacent to the upper portion of the piles is expected to comprise well compacted approach fill placed directly on bedrock or the loose to compact sand identified at the south end of the west abutment and central pier. To accommodate movement of the integral abutments, it is recommended that pre-augered holes filled with loose sand be provided around the piles. The pre-augered holes should be 600 mm diameter and extend 3.0 m below the bottom of the abutment. The gradation of the loose sand should be as specified on Table I.

The coefficient of horizontal subgrade reaction, k_s , for rock fill and Granular "B" backfill may be computed using the following equation:

$$k_s = n_h z/b$$

where z = depth
 b = pile width

The recommended values for n_h in kN/m^3 are as follows:

	Above Groundwater	Below Groundwater
Granular "B"	12,000	8,000
Rock Fill	15,000	9,000

It is anticipated the centre pier will be supported partially on piles and partially on spread footings. The minimum length of pile will be governed by construction and economic considerations. The minimum pile length is likely to be approximately 3.0 m.

Spread Footings

Based on the borehole information, it is considered that the structure may be supported on conventional spread footings founded on bedrock. It must be noted however that excavation for footing construction in the swamp environment is likely to be problematic due to groundwater conditions; footing construction does not appear feasible at the south end of the centre pier.

Foundations bearing on the sound bedrock at elevations 236.2 to 238.4 may be designed using a factored bearing resistance of 10,000 kPa at the ultimate limit state.

The capacity at serviceability limit states normally allows for 25 mm of compression of the founding medium. Considering the bedrock to be non-yielding, the design is not expected to be governed by settlement since the loading required to produce deformation will be much larger than the factored capacity at ULS.

The bedrock surface below the footings should be benched or socketed to provide a level founding surface.

Alternatively, spread footings could be constructed on structural fill placed in the approaches. The engineered fill should comprise OPSS Granular "A" material placed in maximum 200 mm thick lifts, compacted to 100% standard Proctor maximum dry density, and extended laterally to a line inclined outwards at 1:1 (H:V) originating at least 1 m from the top of footing. This scheme is illustrated on Figure 1.

The factored bearing capacities at ultimate (ULS) and serviceability (SLS) limit states of footings constructed on structural fill are as follows:

Assumed Footing Width (m)	Factored Capacity (kPa)	
	ULS	SLS
1	735	250
2	920	250
3	1110	250

The recommended capacity at SLS allows for 25 mm of total settlement; differential settlement is expected to be less than 75% of this value. A footing embedment depth of 1.6 m was assumed for computation of the ULS capacities.

In general, where founding levels of adjacent footings vary, the founding elevation between footings should be stepped in maximum 600 mm steps at a maximum inclination of 10 horizontal to 7 vertical.

All footings subject to frost action should be provided with the normal 1.6 m of earth cover or equivalent thermal insulation. A 25 mm thick layer of polystyrene insulation is thermally equivalent to 600 mm of soil cover. Footings bearing on sound bedrock should not require protection from frost.

Prior to placement of structural concrete, all foundation excavations should be examined by qualified geotechnical personnel to verify the competency of the founding surface.

ABUTMENT WALLS

The abutment walls should be designed to resist the unbalanced lateral earth pressure imposed by the backfill adjacent to the wall. The lateral earth pressure, p , may be computed using the equivalent fluid pressures presented in Section 6-7.4 of the Ontario Highway Bridge Design Code

(OHBDC, 3rd Edition, 1991) or employing the following equation, assuming a triangular pressure distribution:

$$p = K (\gamma h + q)$$

where K = coefficient of lateral earth pressure

γ = unit weight of free-draining
granular material

h = depth below final grade (m)

q = surcharge load (kPa), if present

Free-draining granular material or rock fill should be used as backfill behind the wall. The following parameters are recommended for design:

	Granular "A"	Granular "B"	Rock Fill
Angle of Internal Friction (degrees)	35	32	35
Unit Weight (kN/m ³)	22.8	21.2	18.0
Active Earth Pressure Coefficient (K_a)	0.27	0.31	0.27
At Rest Earth Pressure Coefficient (K_o)	0.43	0.47	0.43
Passive Earth Pressure Coefficient (K_p)	3.69	3.25	3.69

A weeping tile system and/or weeping holes should be installed to minimize the build-up of hydrostatic pressure behind the wall. The weeping tiles should be surrounded by a properly designed granular filter or geotextile to prevent migration of fines into the system. The drainage pipe should be placed on a positive grade and lead to a frost-free outlet.

If spread footings are employed, the horizontal force will be resisted in part by the friction force developed between the underside of footing and the bedrock/structural fill. Unfactored friction

factors of 0.6 and 0.45 are recommended for footings on bedrock and granular fill, respectively.

If dowels into bedrock are employed to increase the lateral resistance of footings founded on bedrock, a factored rock-grout bond stress of 1.4 MPa at the ultimate limit state (resistance factor of 0.4 applied) is recommended for design. The anchors should extend a minimum 30 bar diameters into sound bedrock. The increased lateral resistance will be provided by the increased sliding resistance developed at the interface between the footing and rock due to the increased vertical pressure created by the stress in the anchor.

APPROACH FILL

Backfilling adjacent to the structure should be carried out in conformance with Ontario Provincial Standards specifications for granular or rock backfill.

Recommendations for approach construction are presented in the Pavement Design Report.

EXCAVATION AND GROUNDWATER CONTROL

Excavation for construction of footings, if employed, is expected to be carried out primarily within the approach fill, locally sand. Excavation of the approach fill is expected to be relatively straightforward. The fill would be classified as a Type 3 soil according to Occupational Health and Safety Act criteria.

Depending on the construction scheme adopted, excavation in the peat may also be required for footing construction. The peat is classified as a Type 4 soil; temporary cut slopes inclined at 3 horizontal to 1 vertical, or flatter, will be required.

Control of groundwater in the swamp environment is expected to be difficult.

All work should be carried out in accordance with the Occupational Health and Safety Act (Ontario Regulation 213/91) and with local/MTO regulations.

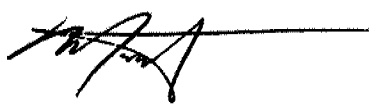
CLOSURE

This report was written by M.R. Anderson, Project Engineer and reviewed by D.W. Kerr, Manager of Geotechnical and Geo-Environmental Services, Hamilton.

Yours very truly

Peto MacCallum Ltd.




Murray R. Anderson, M.Eng., P.Eng.
Project Engineer

MRA:mma



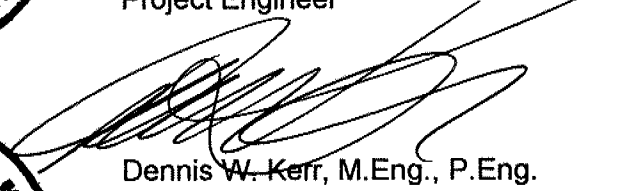

Dennis W. Kerr, M.Eng., P.Eng.
Manager Geotechnical and
Geo-Environmental Services
Hamilton

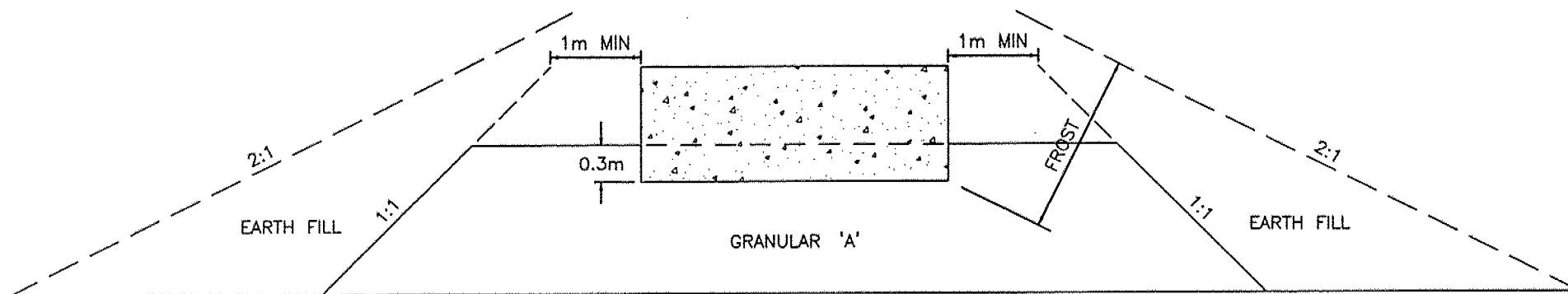
TABLE I

**Gradation Specification for Sand Fill in
Pre-Augered Holes at Integral Abutments**

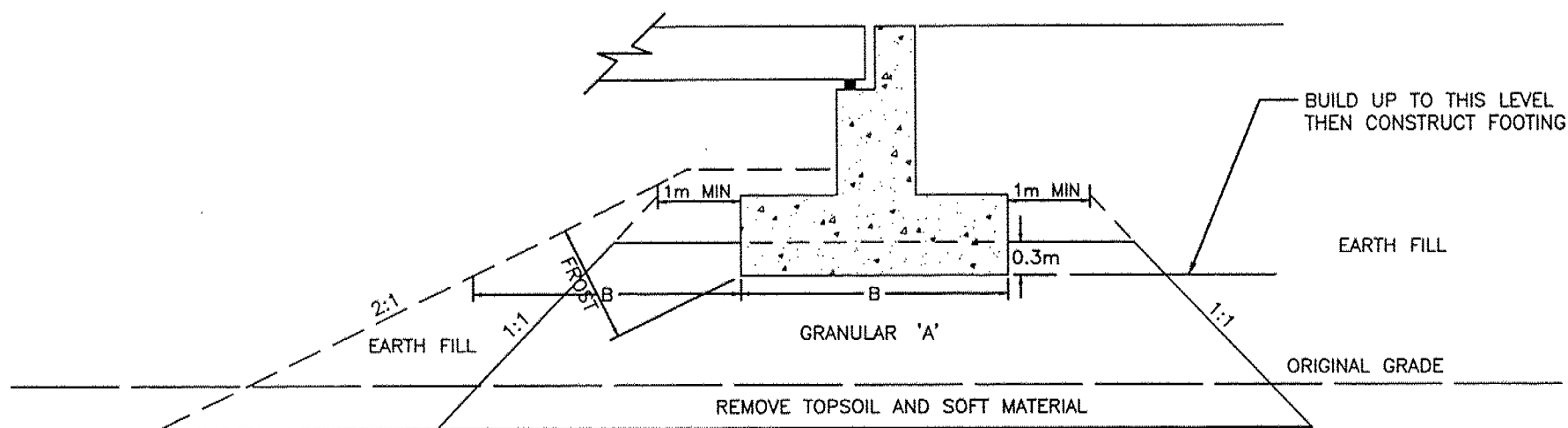
MTO Sieve Designation		Percentage Passing by Mass
2 mm	#10	100
600 μ m	#30	80 - 100
425 μ m	#40	40 - 80
250 μ m	#60	5 - 25
150 μ m	#100	0 - 6

From MTO Report S0-96-01, Revision 1 - July, 1996.

ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



CROSS SECTION



LONGITUDINAL SECTION

NOTES

1. REMOVE TOPSOIL AND/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A' AND EARTH FILL.
2. PLACE GRANULAR 'A' AND EARTH FILL TO BOTTOM OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M.T.O. STANDARDS.
3. CONSTRUCT CONCRETE FOOTING
4. PLACE REMAINDER OF GRANULAR 'A' AND EARTH FILL AS REQUIRED
5. REFER TO TEXT OF REPORT FOR FROST DEPTH

Peto MacCallum Ltd.
CONSULTING ENGINEERS

45 BURFORD ROAD, HAMILTON, ONTARIO L8E 3C6
Tel: (905) 561-2231 Fax (905) 561-6363

DATE	SCALE	JOB NO.	FIGURE NO.
MAR. 1998	NTS	—	1

PAVEMENT DESIGN REPORT
FOR
HIGHWAY 169 UNDERPASS
W.P. 290-97-00, SITE 42-320
HIGHWAY 69, DISTRICT 52
HUNTSVILLE, ONTARIO

Distribution:

15 cc: McCormick Rankin Corporation
1 cc: PML Hamilton
1 cc: PML Barrie
1 cc: PML Toronto

Job No. 97TF088C

June, 1998

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D Rockfill Drainage in Slope Flattened Areas	

PAVEMENT DESIGN REPORT

For

Highway 169 Underpass

W.P. 290-97-00, Site 42-320

Highway 69, District 52, Huntsville

INTRODUCTION

Highway 169 underpass is being constructed as an advance contract to the overall 26.5 km four laning of Highway 69, W.P. 290-97-00. The following roadworks are associated with the advance construction of Highway 169 underpass:

- future south bound lanes of Highway 69 between approximate Station 11+900 and Station 12+120, (Freeman Twp.).
- 50 m bridge approaches approximate Station 9+920 to Station 10+080 Highway 169.

This report presents the geotechnical investigation and survey data as well as recommendations pertaining to the roadworks associated with the advance contract.

DESIGN CRITERIA

The approved Design Criteria for the overall project was provided with a memorandum dated March 26, 1998, from Mr. P. Lecoarer, P. Eng., Senior Project Engineer, Planning and Design Section, MTO Northern Region.

Documents showing the proposed design standards and traffic volumes for Highway 69, and the proposed design standards for Highway 169 (existing Highway 69) were extracted from the approved Design Criteria and provided in Appendix A. No traffic volumes are provided for Highway 169.

A frost penetration depth of 1.6 m has been provided by MTO for this project.

PHYSIOGRAPHY AND GEOLOGY

The report area is part of the Precambrian Laurentian peneplane. Although the general surface of the country is relatively flat the topography is quite irregular in detail and the area is dotted with many small lakes separated by rocky ridges. Soil cover is generally sparse. The area is well wooded.

It is underlain by granitic and metamorphic gneisses, and in many places the structural alignment of the gneisses influences the topography. In this regard, the rivers and lakes underlain by the gneisses of the Moon River syncline in Conger and Freeman Townships follow the foliation trends of the gneisses.

The bedrock formations are of Precambrian age and are largely composed of veined, banded, and homogeneous pink and grey migmatitic gneisses produced by injection and granitization of metamorphic gneisses of various types.

INVESTIGATION PROCEDURES

The geotechnical investigation for the advance contract was carried out as part of the overall project, which was conducted during the period December 1997 to April 1998.

The investigation consisted of test holes put down using hand auger, backhoe and/or power auger. The test hole program was carried out in accordance with the requirements of MTO Northern Region Pavement Design Practices And Guidelines (May 20, 1997), involving test holes along centreline of pavement and offsets left and right.

Soil samples were recovered from each test hole for field identification. Representative samples were returned to our laboratory for detailed examination and moisture content determinations.

The test holes were referred horizontally to centreline median for Highway 69 and centreline of pavement for Highway 169, as staked out in the field by Totten Sims Hubicki Associates. Elevations were established relative to the ground surface at the control line.

SUBSURFACE CONDITIONS

Reference is made to Appendix B for the geotechnical survey data collected within the limits of the advance contract as well as data collected just beyond the limits of the advance contract. Reference is also made to the test holes drilled in connection with the foundation investigation for the proposed underpass structure.

The proposed roadway alignments are situated principally within a relatively flat low lying swamp area and locally, cross slightly elevated ridges comprising bedrock mantled with thin discontinuous overburden cover.

Organic Deposits

Peat was encountered as follows:

		<u>Maximum Depth of Peat</u>
Hwy 69 SBL	11+950 - 12+040	1.5 m
	12+080 - 12+120* (project limit)	1.4 m
Hwy 169	9+935 - 10+080** (project limit)	3.3 m

* Peat ends at about the north project limit.

** Peat extends well past the east project limit with peat up to 5.3 m thick.

The peat is underlain by bedrock in most cases, or local pockets (0.2 to 3.1 m thick) of silty fine sand to fine to medium sand, or clayey silt to sandy silt (500 to 800 mm thick) over bedrock at depths of 3.3 m or less.

Overburden

Silt topsoil exists discontinuously, ranging between 200 and 600 mm (typically 200 to 300 mm) in thickness. A localised 200 to 850 mm thick deposit of sandy silt was encountered near the south limit of Hwy 69 South Bound Lanes.

Bedrock

Within the swamp areas, bedrock was encountered at depths of 3.3 m or less. Within the adjacent slightly elevated areas, rock was exposed or was contacted at depths of up to 850 mm below the discontinuous topsoil and overburden mantle. The bedrock typically comprised pink granitic gneiss.

Groundwater

Groundwater was generally within 300 mm above or below grade.

RECOMMENDATIONS

Pavement Types and Depths

It is understood that no pavements will be placed as part of the advanced contract.

Granular Types and Depths

The advanced portion of Highway 69 south bound lanes and Highway 169 approaches will not be used for traffic. Therefore there is no functional need at this time for granulars. Delaying placement of granulars is desirable to prevent potential contamination, which may otherwise occur.

Cut Sections

Cognizant of the finished grades, no cut sections are anticipated for the advance section of Highway 69 south bound lanes, and Highway 169 approaches (50 m).

Embankment Material and Design

The proposed Highway 69 south bound lanes will require some 2 to 3 m of fill. Highway 169 approaches to the underpass will require some 10 m of fill.

Much of the alignment will be constructed over swamp. Refer to Section 6.5 for Muskeg treatment.

The remaining sections of embankments will be constructed over bedrock where no major construction problems are anticipated.

It is understood that the embankments will be constructed using rock fill. Rockfill embankment should be constructed in accordance with OPSD 201.01, 201.02 and 202.01.

The source of rock fill for the advance contract was not determined at the time of this report.

For high rock fill embankments provide 2.0 m wide berms so that no uninterrupted rock fill slope is greater than 6.0 m high. For the Highway 169 approaches where the embankment is up to 10 m high, provide berm at mid-height of slope.

Excavated peat may be used for slope flattening. Provide drainage gap in accordance with OPSD 202.02. Where slopes are flattened to eliminate the need for guide rail, provide granular infilled drainage gap in accordance with Northern Region practice, refer to Appendix D.

Muskeg Treatment

The location and maximum depth of peat, underlying material and proposed maximum fill height are summarized below:

Chainage	Maximum Fill Height (m)	Maximum Depth of Peat	Underlying Material (m)
Hwy 69 SBL 11+950-12+040	3.0	1.5	Bedrock or discontinuous sand over bedrock
12+080-12+120* (project limit)	2.0	1.4	Bedrock or discontinuous clayey silt/sandy silt over bedrock
Hwy 169 9+935-10+080** (project limit)	10.0	3.3	Bedrock or discontinuous sand over bedrock

* Peat ends at about the north project limit.

** Peat extends well past the east project limit with peat up to 5.0 m thick.

Muskeg treatment should be carried out in accordance with OPSD 203.01(MOD) Appendix C, involving excavation of the peat (anticipated maximum 3.3 m) down to firm ground (bedrock or localised mineral soil).

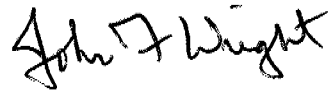
There is some potential for long term settlement for embankments constructed in swamp environments. In accordance with Northern Region practice, the top of the rock fill embankment should be constructed 2.0 m wider on each side of centreline in order to accommodate future grade raises.

CLOSURE

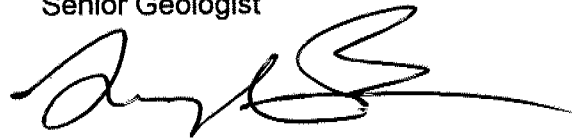
The field investigation was carried out under the direction and supervision of Mr. J. F. Wright, B.Sc., Senior Geologist and Mr. E. Wong, P. Eng. This report was prepared by Mr. John Wright and reviewed by Mr. T. Lee-Bun, P.Eng. Manager, Geotechnical Engineering, Barrie office.

Yours very truly

Peto MacCallum Ltd.



John F. Wright, B.Sc.
Senior Geologist



Turney Lee-Bun, P.Eng.
Manager, Geotechnical Engineering
Barrie



JFW:mmma

APPENDIX A

EXTRACT FROM DESIGN CRITERIA

Ministry of
Transportation

Ontario

DESIGN CRITERIA

Page 1 of 1

Date:

February 1998

Reg.Rev.Date:

GROUP WORK PROJECT 290-97-00 Dist. No. 52 Hwy. No. 69
 TYPE OF PROJECT Grading, Drainage, Granular Base, Hot Mix Paving, Structures, Partial Illumination
 LOCATION From South of Tower Road Northerly to 2.7 km North of Hwy 141 LENGTH 26.6
 LIMITS FROM STA 11+000 PLAN 790-69/5-0 TO STA 14+900 PLAN 451-69/122-4

HIGHWAY CLASSIFICATION

MINIMUM STOPPING SIGHT DISTANCE

EQUIVALENT MINIMUM "K" FACTOR

GRADES MAXIMUM

MINIMUM RADIUS

PAVEMENT WIDTH

SHOULDER WIDTH

SHOULDER ROUNDING

MEDIAN WIDTH

ROW WIDTH

POSTED SPEED

MISCELLANEOUS

PRESENT CONDITIONS	DESIGN STANDARDS	PROPOSED STANDARDS
	RFD 120	RFD 120
	245 m	300 m
	K = 120 Crest; 60 Sag	K = 180 Crest; 100 Sag
	3%	2%
	650 m	1000 m
	4 @ 3.75 m	4 @ 3.75 m
	1.0 m Lt 3.0 m Rt	1.0 m Lt (a) 3.0 m Rt
	1.0 m	1.0 m
	30 m	30 m
	100 m	100 m (b)
	100 km/h	100 km/h

RECOMMENDED BY:

P.Eng.

PROJECT MANAGER
HIGHWAY 69 JOINT VENTURE (MRC/T)

DISTRICT ENGINEER
MANAGER, CONSTRUCTION O

APPROVED BY:

REGIONAL MANAGER
ENGINEERING OFFICE
 98/03/25
DATE OF APPROVAL

TRAFFIC DATA: See page No. 2

MAR-31-1998 16:17

P.04

Ministry of
Transportation

DESIGN CRITERIA

Page 2 of 3

12

Date:

February 1998

Reg. Rev. Date:

GROUP WORK PROJECT 290-97-00 Dist. No. 52 Hwy. No. 69
 TYPE OF PROJECT Grading, Drainage, Granular Base, Hot Mix Paving, Structures, Partial Illumination
 LOCATION From South of Tower Road Northerly to 2.7 km North of Hwy 141 LENGTH 25.6
 LIMITS FROM STA 11+000 PLAN 790-69/5-0 TO STA 14+900 PLAN 451-69/122-4

TRAFFIC DATA

EXISTING HIGHWAY 69				
		2001	2011	2021
Muskoka Road 11 (W)	AADT	7600	9100	10600
	SADT	13000	15800	18400
	DHV	1490	1780	2040
	PHV	1460	1750	2010
	% Com	8.1%		
	AR*	0.8	(PAR 1.0)	
	LOS	E	F	
Highway 169 (E) - South Junction of Buckeye Road	AADT	7000	8400	9800
	SADT	12000	14400	16800
	DHV	1370	1650	1910
	PHV	1440	1730	2000
	% Com	9.2%		
	AR*	0.8	(PAR 1.0)	
	LOS	F	F	
Murphy Road (E)	AADT	7000	8400	9800
	SADT	12000	14400	16800
	DHV	1370	1650	1910
	PHV	1440	1730	2000
	% Com	10.7%		
	AR*	0.6	(PAR 1.0)	
	LOS	E	F	
Hwy 612 (W)	AADT	7300	8800	10200
	SADT	12500	15000	17400
	DHV	1430	1720	2000
	PHV	1450	1740	2020
	% Com	10.7%		
	AR*	0.9	(PAR 1.0)	
	LOS	F	F	

Ministry of
Transportation

Ontario

DESIGN CRITERIA

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P.07
12

Date:

February 1998

Reg.Rev.Date:

GROUP WORK PROJECT 290-97-00 Dist. No. 52 Hwy. No. 69
 TYPE OF PROJECT Grading, Drainage, Granular Base, Hot Mix Paving, Structures, Partial Illumination
 LOCATION From South of Tower Road Northerly to 2.7 km North of Hwy 141 LENGTH 26.6
 LIMITS FROM STA 11+000 PLAN 790-69/5-0 TO STA 14+900 PLAN 451-69/122-C

9. Railway Crossings

Two new rail crossings are required by this project:

1. CP Rail (Parry Sound Subdivision)

A new grade separation will be built at Station 15 + 650, Township of Seguin (former Township of Humphrey). A track realignment may be required to maintain CP Rail's operations during construction. Details to be finalized during detailed design.

2. CN (Bala Subdivision)

Grade separations will be constructed for the northbound and southbound lanes of Highway 69 at Station 19 + 300 Township of Seguin (former Township of Humphrey).

10. Sideroads

The design criteria for the various sideroads are as follows:

Highway 169 (Existing Highway 69). From Highway 69 Northerly 1.1 km		
ITEM	DESIGN STANDARD	PROPOSED STANDARD
Classification	RAU 100	RAU 100
Design Speed (km/h)	100	100
Minimum Stopping Sight-Distance (m)	185	310
Equivalent 'K' Factor		
Sag	45	80
Crest	70	70
Maximum Grade (%)	8	2
Minimum Radius (m)	420	420
Pavement Width (m)	7.0	7.0
Shoulder Width (m)	2.5	2.5
Minimum ROW Width (m)	40	40
Posted Speed (km/h)	80	80

APPENDIX B

GEOTECHNICAL SURVEY DATA

GEOTECHNICAL SURVEY DATA

W.P. 290-97-00

SURVEY DATE

December 1997 to April 1998

TYPE OF SURVEY

Peto MacCallum Ltd.
(Hand Auger, Power Auger, Backhoe)

NOTES

1. Conditions and pavement depths apply only to the date of the survey.
2. The boundaries between the strata have been established only at test hole locations. Between test holes the boundaries are assumed and may be subject to error.
3. Soils are described according to the MTO Soils Classification System.
4. Abbreviations for test holes and test data conform to OPSD 100.06.

WP 290-97-00 Highway 69

District 52, Huntsville

Highway 69, Southbound Lane, Twp of Freeman

Datum Centre Line Median

11+850 10.7 LT C/L D-1.65
0 NFP BR

11+850 18.8 LT C/L D-2.60
0- 450 Dk Br Si Tps
450 NFP BR

11+850 27.3 LT C/L D-2.90
0- 300 Blk Si Tps
300- 1.30 Br Say Si Wet
w @ 800 = 36%
1.30 NFP BR
Fr Wat @ 300

11+900 10.3 LT C/L D-200
0- 600 Dk Br Si Tps
600 NFP BR

11+900 18.8 LT C/L D-850
0- 250 Dk Br Si Tps
250 NFP BR

11+900 27.3 LT C/L D-650
0- 200 Dk Br Say Si Tps
200- 850 Lt Br Say Si Wet
850 NFP BR

11+950 7.8 LT C/L D+150
0- 500 Blk Amor Peat Wet
500- 700 Br Med Sa W Gr Tr Si Wet
700 NFP BR

11+950 18.8 LT C/L D-300
0- 300 Dk Br Si Tps
300 NFP BR

11+950 28.8 LT C/L D+900
0- 300 Dk Br Si Tps
300 NFP BR

11+985 7.8 LT C/L D-250
0- 100 Fr Wat
100- 1.10 Blk Amor Peat Wet
1.10 NFP BR

11+985 18.8 LT C/L D+350
0- 200 Blk Si Tps
200 NFP BR

11+985 29.8 LT C/L D+150
0- 300 Blk Si Tps
300 NFP BR

12+010 7.8 LT C/L D-500
0- 400 Blk Amor Peat Wet
400 NFP BR
Fr Wat @ 0

12+010 18.8 LT C/L D-470
0- 1.50 Blk Amor Peat Wet
1.50 NFP BR
Fr Wat @ 0

12+010 29.8 LT C/L D
0- 1.35 Blk F Fib Peat
1.35 NFP BR
Fr Wat @ 330

Highway 69, Southbound Lane, Twp of Freeman
Datum Centre Line Median

12+035 7.8 LT C/L D-700
0- 200 Fr Wat
200- 600 Blk F Fib Peat Wet
600- 1.20 Gry Siy F Sa Wet
1.20 NFP BR

12+035 18.8 LT C/L D-100
0- 200 Fr Wat
200- 600 Blk F Fib Peat Wet
600 NFP BR

12+035 29.8 LT C/L D-700
0- 300 Blk F Fib Peat
300 NFP BR
Fr Wat @ 100

12+050 8.5 LT C/L D+300
0 NFP BR

12+050 18.8 LT C/L D-150
0 NFP BR

12+050 32.8 LT C/L D+1.30
0 NFP BR

12+095 10.8 LT C/L D
0- 1.40 Blk Amor Peat
1.40- 1.70 Gry Say Si Wet
1.70- 1.90 Soft Gry Cly Si Wet
1.90 NFP BR

12+095 18.8 LT C/L D
0- 1.30 Blk Amor Peat
1.30- 2.10 Gry Say Si Wet
2.10 NFP BR
Fr Wat @ 0

12+095 26.8 LT C/L D
0- 1.20 Blk Amor Peat
1.20- 1.90 Gry Cly Si W Sa Wet
w @ 1.50 = 56%
1.90 NFP BR
Fr Wat @ 50

12+115 8.3 LT C/L D-300
0- 700 Blk Amor Peat
700 NFP BR
Fr Wat @ 0

12+115 18.8 LT C/L D-300
0- 500 Blk Amor Peat
500 NFP BR
Fr Wat @ 0

12+115 29.3 LT C/L D-300
0- 300 Blk Amor Peat
300 NFP BR
Fr Wat @ 0

12+150 8.0 LT C/L D-550
0 NFP BR

12+150 18.8 LT C/L D-1.25
0 NFP BR

12+150 34.0 LT C/L D-230
0- 300 Blk Si Tps
300 NFP BR

WP 290-97-00 Highway 69
District 52, Huntsville
Highway 169
Datum Centre Line Pavement

9+900 C/L D+100
0 NFP BR

9+900 12.0 LT C/L D-3.00
0 - 350 Blk Si Tps
350 NFP BR

9+900 12.0 RT C/L D+700
0 NFP BR

9+925 C/L D
0 NFP BR

9+925 16.5 LT C/L D+200
0- 200 Blk Siy Sa Tps
200 NFP BR

9+925 16.5 RT C/L D-500
0- 200 Blk Siy Sa Tps
200- 600 Br F To Med Siy Sa
600 NFP BR

9+950 C/L D
0- 125 Fr Wat
125- 1.50 Blk Amor Peat
1.50 NFP BR

9+950 18.5 LT C/L D
0- 300 Fr Wat
300- 2.00 Blk F Fib To Amor Peat
2.00- 5.10 Comp Gry F To Med Sa W Si Wet
5.10 NFP BR

9+950 18.5 RT C/L D
0- 200 Fr Wat
200- 800 Blk F Fib Peat
800- 1.00 Gry Med To Co Sa Tr Si
1.00 NFP BR

10+050 C/L D
0- 150 Fr Wat
150- 2.45 Amor Peat
2.45 NFP BR

10+050 18.0 LT C/L D
0- 1.95 Blk Amor Peat
1.95 NFP BR
Fr Wat @ 0

10+050 18.0 RT C/L D
0- 3.30 Blk Amor Peat
3.30 NFP BR
Fr Wat @ 0

10+075 C/L D
0- 255 Fr Wat
255- 2.45 Blk F Fib Peat
2.45 NFP BR

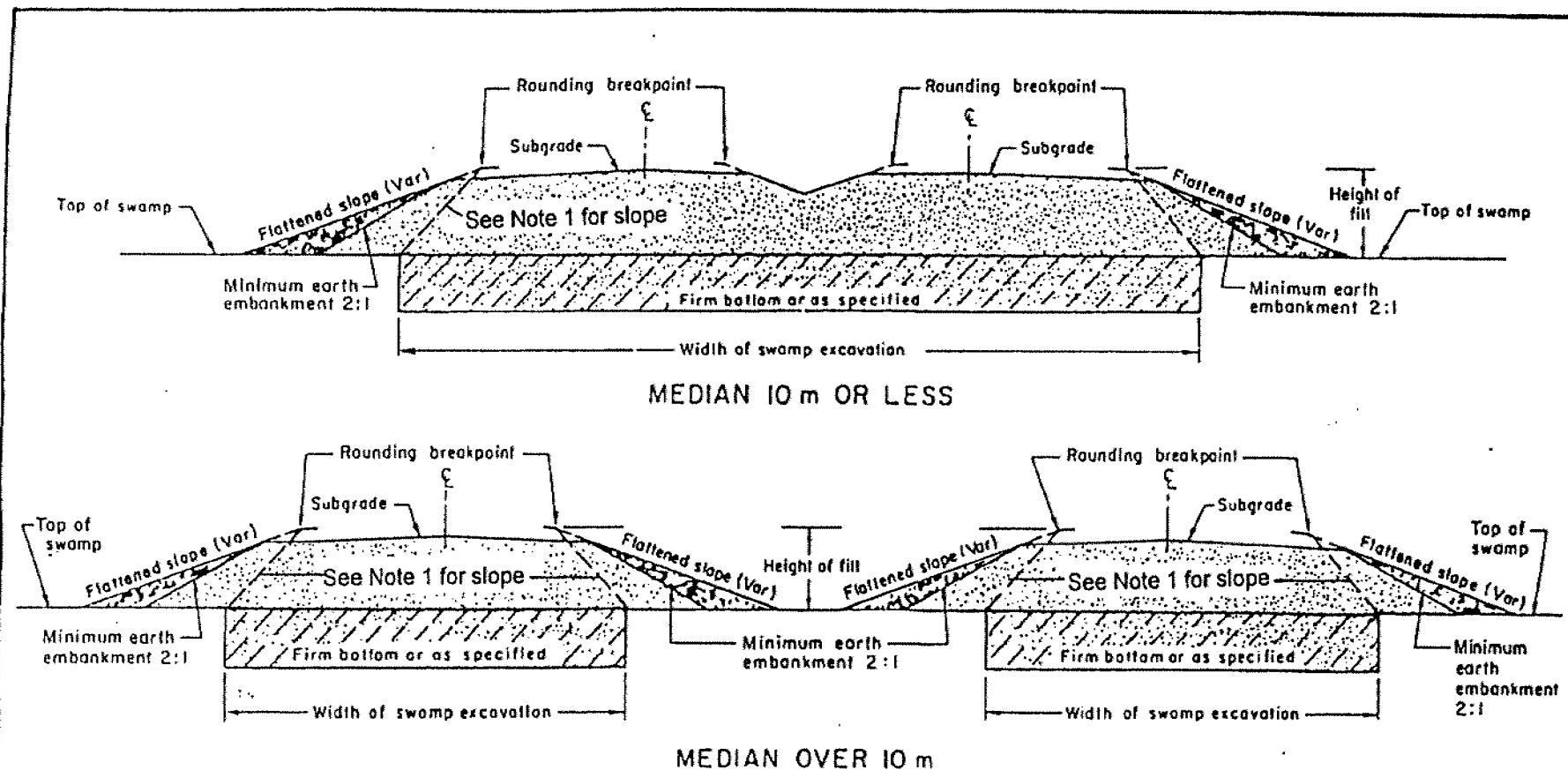
10+100 C/L D
0- 150 Fr Wat
150- 4.55 Blk Amor Peat
w @ 2.15 = 1185%
w @ 3.65 = 510%
4.55- 4.70 F Med Sa
w @ 4.60 = 28%
4.70 NFP BR

10+100 17.0 LT C/L D
0- 125 Fr Wat
125- 5.00 Blk Amor Peat
5.00- 6.20 Gry Siy Cl
w @ 6.22 = 42%
6.20 NFP BR

10+100 17.0 RT C/L D
0- 150 Fr Wat
150- 3.55 Blk Amor Peat
3.55 NFP BR

APPENDIX C


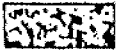

**EMBANKMENTS OVER SWAMP
OPSD 203.01 (MOD) and OPSD 203.05 (MOD)**



NOTES:

1. To determine width of excavation:
Use 1.5 : 1 slope for rock fill.
Use 2 : 1 slope for earth fill.

LEGEND:

-  Embankment materials as specified
-  Excavated swamp material
-  Excavate and backfill

ONTARIO PROVINCIAL STANDARD DRAWING

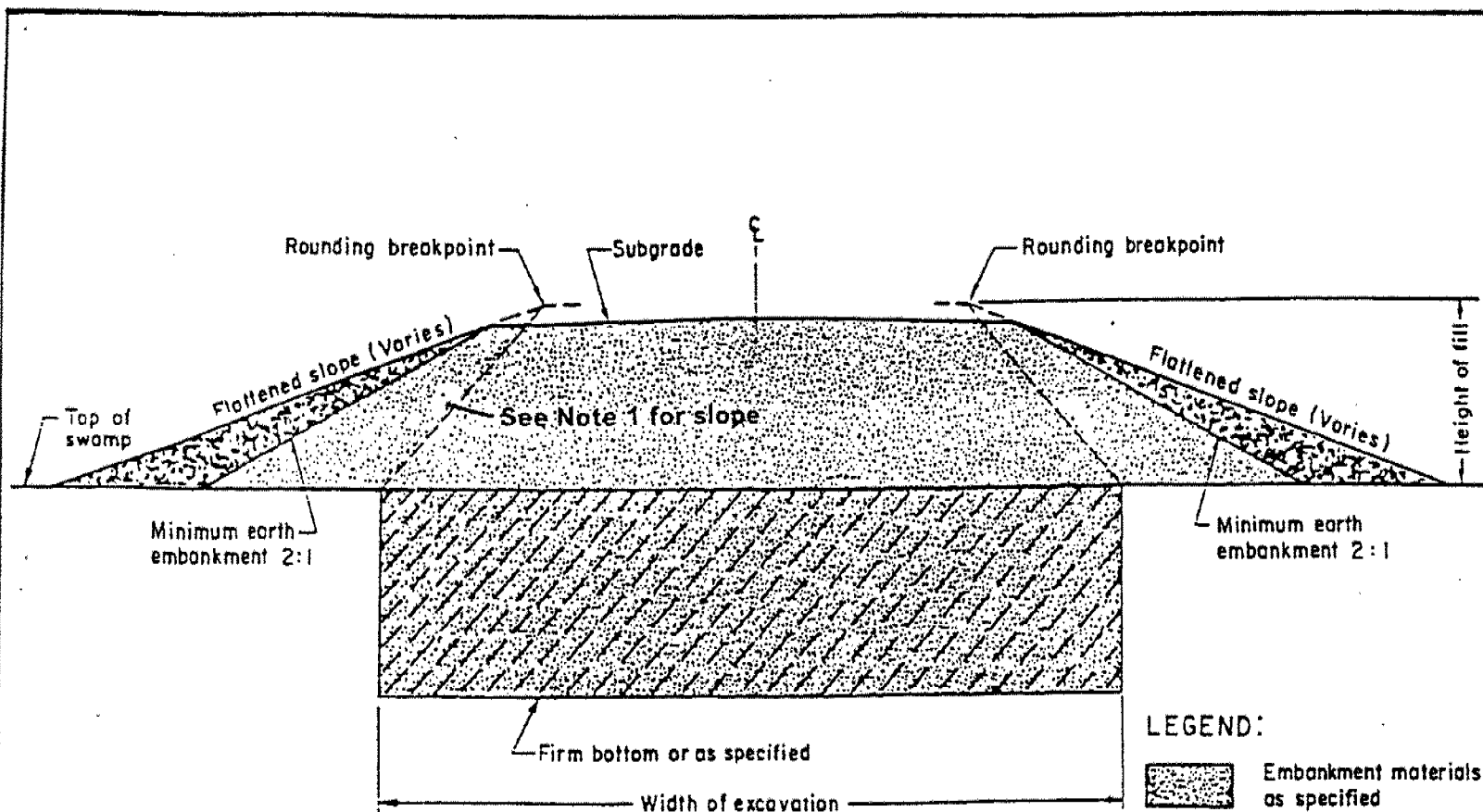
EMBANKMENTS OVER SWAMP

DIVIDED ROADS

Date 1990 04 02 Rev 1

Date _____

OPSD-203.01 (Mod)



NOTES:

1. To determine width of excavation:
use 1.5:1 slope for rock fill
use 2:1 slope for earth fill

ONTARIO PROVINCIAL STANDARD DRAWING

EMBANKMENTS OVER SWAMP
UNDIVIDED ROADS

Date 1990 04 02 Rev 1

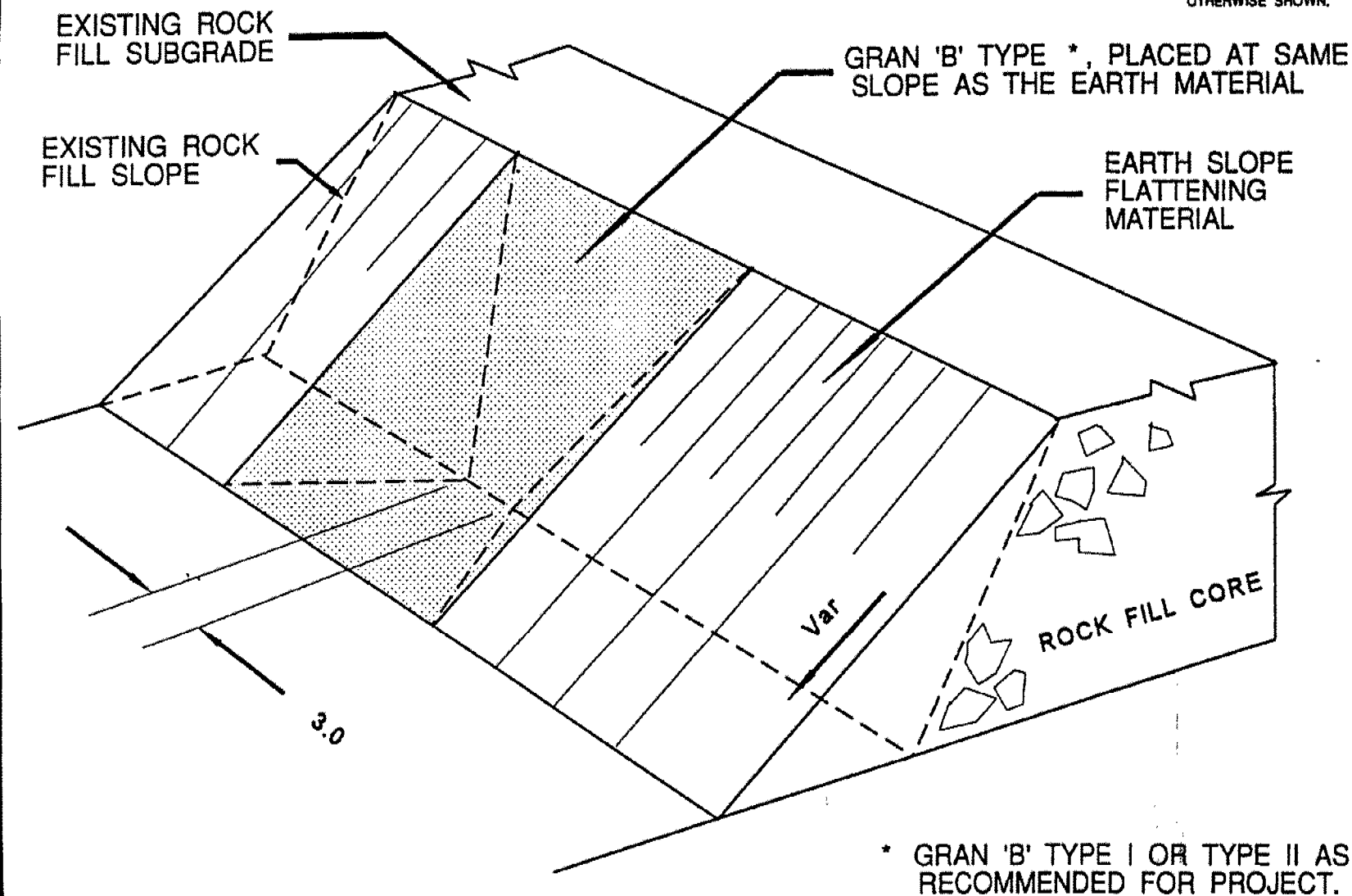
Date _____

OPSD - 203.05 (MOD)

APPENDIX D

ROCKFILL DRAINAGE IN SLOPE FLATTENED AREAS

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



ROCK FILL DRAINAGE IN SLOPE FLATTENED AREAS

NOT TO SCALE

Peto MacCallum Ltd.
C O N S U L T I N G E N G I N E E R S

May 20, 1998

Our Ref: 97 TF 088 C

Mr. P. Turner, P.Eng.
McCormick Rankin Corporation
2655 North Sheridan Way
Mississauga, Ontario
L5K 28P

Dear Mr. Turner

Pavement Report For Advance Contract
Roadways In Connection With Highway 169 Underpass
W.P. 290-97-00, Site 42-320 Highway 69
District 52, Huntsville, Ontario

Further to our report dated April 30, 1998, and pursuant to discussions with Mr. K. MacInally, P.Eng. and Mr. J. Wieczorek, P.Eng., of Totten Sims Hubicki Associates, the advance contract limits are expanded so that the swamp identified in the structure approach area can be treated over it's full length. Also, the expansion will include a cut section on Highway 169 Connection to generate rock fill. The expanded limits therefore include:

- Highway 169 Connection
- Part of S-E Ramp

The test hole logs for Highway 169 Connection and S-E Ramp are enclosed. The following recommendations are provided to cover the expanded advance contract limits. Amendments are also provided to reflect recent revisions to OPSD's.

Rock Cut

Up to 8 m of cut is required on Highway 169 Connection between about Station 10+290 to 10+780. This cut will be in bedrock with discontinuous shallow topsoil or sand overburden. Refer to OPSD 201.01 for grading.

No particular slope treatment is specified for rock cuts. It is recommended however, that the exposed rock faces be examined visually for any planes of weakness which should be investigated/addressed on an as required basis during construction.

Excavated rock will be used as embankment material.

Rock Fill Embankment

For high rock fill, provide 2 m wide benches, if applicable, such that the portion of rock fill embankment above the bench is no more than 10 m high, in accordance with OPSD 202.010.

...2

P. Turner, P.Eng., May 20, 1998, P2

Our Ref: 97TF088 C

Where slope flattening is proposed, provide drainage gap in accordance with OPSD 202.020.

Transition Treatment

Transition zones should be treated in accordance with applicable OPSD 205.01 to 205.05.
Use $t = 1.6$ m and $H = 200$ mm. Topsoil will form part of the grubbing quantities and will not be available for reuse.

Muskeg Treatment

Swamp treatment should be carried out as follows:

	MAX FILL HEIGHT h (m)	MAX DEPTH OF PEAT (peat plus soft soil) d (m)	UNDERLYING MATERIAL	TREATMENT
<u>HWY 69 SBL</u> 11+950 - 12+040	3.0	1.5	Bedrock or 0.2 to 0.6 m sand over bedrock	OPSD 203.010
12+080 - 12+120	2.0	1.4 (2.1)	Bedrock or 0.2 to 0.8 m soft clayey silt/sandy silt over bedrock	OPSD 203.010
<u>HWY 169 CON</u> 9+935 - 10+085	10.0	3.3	Bedrock or 0.2 to 3.1 m sand over bedrock	OPSD 203.010 (MOD) Appended
10+085 - 10+200	10.0	4.8 (6.0 max)	Bedrock or sand over discontinuous soft silty clay layer (0.6 to 1.8 m thick) to 4.7 to 7.5 m depth over bedrock at 4.7 to 8.0 m depth	Dwg 3, Appended Note 1
10+200 - 10+250	10.0	2.3 (3.2)	Bedrock or silty clay (0.9 m thick) to 3.2 m depth over bedrock at 0.5 to 3.2 m depth	OPSD 203.010 (MOD) Appended
<u>S-E RAMP</u> 11+900 - 12+050	7.0	5.6 (6.0 max)	Bedrock or sand over discontinuous soft clay/clay and silt layers (0.5 to 1.2 m thick) to 4.3 to 9.9 m depth over bedrock at 0.9 to 9.9 m depth	OPSD 203.010 (MOD) Appended Note 1
12+050 - 12+175	7.0	3.4 (3.2)	Bedrock or sand over discontinuous soft clayey silt/silt and clay layers (0.9 m thick) to 3.2 to 4.1 m over bedrock at 2.9 to 4.7 m depth	OPSD 203.010 (MOD) Appended

Note 1: Place 500 mm Granular "B" Type II surcharge above proposed finished grade for at least four months.

P. Turner, P.Eng., May 20, 1998, P3

Our Ref: 97TF088 C

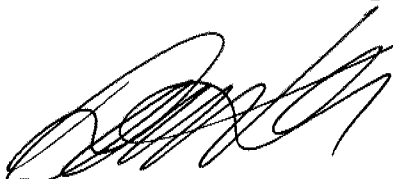
We trust this supplementary report provides the necessary information for the expanded contract limits.

Sincerely

PETO MacCALLUM LTD.



Turney Lee-Bun, P.Eng.
Manager, Geotechnical Engineering (Barrie)



Dennis W. Kerr, M. Eng., P.Eng.
Manager, Geotechnical Engineering (Hamilton)



TLB\DWK:ga

Enclosures: (9)

4 cc: McCormick Rankin Corporation
1 cc: PML Barrie
1 cc: PML Hamilton
1 cc: PML Toronto

WP 290-97-00 Highway 69

District 52, Huntsville

Highway 169 Connection

Datum Centre Line Pavement

9+900 C/L D+100
0 NFP BR

9+900 12.0 LT C/L D-3.00
0- 350 Blk Si Tps
350 NFP BR

9+900 12.0 RT C/L D+700
0 NFP BR

9+925 C/L D
0 NFP BR

9+925 16.5 LT C/L D+200
0- 200 Blk Siy Sa Tps
200 NFP BR

9+925 16.5 RT C/L D-500
0- 200 Blk Siy Sa Tps
200- 600 Br F To Med Siy Sa
600 NFP BR

9+950 C/L D
0- 125 Fr Wat
125- 1.50 Blk Amor Peat
1.50 NFP BR

9+950 18.5 LT C/L D
0- 300 Fr Wat
300- 2.00 Blk Amor Peat
2.00- 5.10 Comp Gry F To Med Sa W Si Wet
5.10 NFP BR

9+950 18.5 RT C/L D
0- 200 Fr Wat
200- 800 Blk F Fib Peat
800- 1.00 Gry Med To Co Sa Tr Si
1.00 NFP BR

10+050 C/L D
0- 150 Fr Wat
150- 2.45 Blk Amor Peat
2.45 NFP BR

10+050 18.0 LT C/L D
0- 1.95 Blk Amor Peat
1.95 NFP BR
Fr Wat @ 0

10+050 18.0 RT C/L D
0- 3.30 Blk Amor Peat
3.30 NFP BR
Fr Wat @ 0

10+075 C/L D
0- 255 Fr Wat
255- 2.45 Blk F Fib Peat
2.45 NFP BR

10+270 C/L D
0 NFP BR

10+270 15.0 LT C/L D+100
0- 100 Blk Si Tps
100- 600 Br Sa Tr Si
600 NFP BR

10+270 15.0 RT C/L D-100
0- 100 Blk Si Tps
100- 500 Br Sa Tr Si
500 NFP BR

10+280 C/L D
0- 100 Blk Si Tps
100- 600 Br Sa Tr Si
600 NFP BR

10+280 10.5 LT C/L D-300
0- 100 Blk Si Tps
100- 400 Br Sa Tr Si

Highway 169 Connection
Datum Centre Line Pavement

400 NFP BR

10+280 10.5 RT C/L D
0 NFP BR

Highway 169 Connection

Datum Centre Line Pavement

10+300 C/L D
0 NFP BR

10+300 10.5 LT C/L D-300
0 NFP BR

10+300 10.5 RT C/L D
0 NFP BR

10+320 C/L D
0 NFP BR

10+320 10.5 LT C/L D-300
0 NFP BR

10+320 10.5 RT C/L D+700
0 NFP BR

10+340 C/L D
0 NFP BR

10+340 10.5 LT C/L D-800
0 NFP BR

10+340 18.0 RT C/L D+1.45
0- 100 Org M
100 NFP BR

10+360 C/L D
0 NFP BR

10+360 10.5 LT C/L D-300
0 NFP BR

10+360 16.0 RT C/L D+700
0 NFP BR

10+380 C/L D
0 NFP BR

10+380 10.5 LT C/L D-1.10
0- 200 Blk Si Tps
200 NFP BR

10+380 15.0 RT C/L D+1.30
0 NFP BR

10+400 C/L D
0 NFP BR

10+400 10.5 LT C/L D-300
0- 100 Blk Si Tps
100 NFP BR

10+400 15.0 RT C/L D+800
0- 200 Blk Si Tps
200 NFP BR

10+420 C/L D
0 NFP BR

10+420 10.5 LT C/L D-200
0 NFP BR

10+420 14.0 RT C/L D+400
0- 250 Blk Si Tps
250 NFP BR

10+440 C/L D
0 NFP BR

10+440 10.5 LT C/L D-200
0 NFP BR

10+440 13.0 RT C/L D+400
0 NFP BR

10+460 C/L D
0- 200 Blk Si Tps
200- 800 Br Sa Tr Si
800 NFP BR

10+460 10.5 LT C/L D+400
0- 200 Blk Si Tps
200- 800 Br Sa Tr Si

**Highway 169 Connection
Datum Centre Line Pavement**

800	NFP BR	10+540	C/L	D
		0	NFP BR	
10+460	13.0 RT C/L	D-300		
0- 300	Blk Si Tps			
300	NFP BR			
10+480	C/L	D		
0	NFP BR			
10+480	10.5 RT C/L	D-500		
0- 300	Blk Si Tps			
300	NFP BR			
10+480	20.0 LT C/L	D+1.30		
0- 100	Blk Si Tps			
100	NFP BR			
10+500	C/L	D		
0	NFP BR			
10+500	10.5 RT C/L	D-200		
0- 300	Blk Si Tps			
300	NFP BR			
10+500	17.0 LT C/L	D+1.40		
0- 100	Blk Si Tps			
100	NFP BR			
10+520	C/L	D		
0- 300	Blk Si Tps			
300	NFP BR			
10+520	10.5 RT C/L	D+300		
0	NFP BR			
10+520	15.0 LT C/L	D-100		
0- 300	Fr Wat			
300- 500	Blk Si Tps			
500	NFP BR			
		10+540	10.5 RT C/L	D-900
		0- 300	Blk Si Tps	
		300	NFP BR	
		10+540	14.0 LT C/L	D+500
		0- 100	Blk Si Tps	
		100	NFP BR	
		10+560	C/L	D
		0- 800	Blk Si Tps	
		800	NFP BR	
		10+560	10.5 RT C/L	D+100
		0- 100	Blk Si Tps	
		100	NFP BR	
		10+560	12.0 LT C/L	D+1.40
		0- 100	Blk Si Tps	
		100	NFP BR	
		10+580	C/L	D-300
		0	NFP BR	
		10+580	10.5 LT C/L	D-300
		0- 300	Blk Si Tps	
		300	NFP BR	
		10+580	10.5 RT C/L	D+200
		0- 500	Blk Si Tps	
		500- 800	Br Sa Tr Si	
		800	NFP BR	
		10+600	C/L	D
		0- 100	Blk Si Tps	
		100	NFP BR	

Highway 169 Connection

Datum Centre Line Pavement

10+600	10.5 LT C/L	D+200	0- 700	Blk Si Tps Wet
0	NFP BR		700	NFP BR
10+600	10.5 RT C/L	D-100	10+680	C/L D
0	NFP BR		0	NFP BR
10+620	C/L	D	10+680	10.5 LT C/L D+2.70
0- 200	Blk Si Tps		0	NFP BR
200	NFP BR			
10+620	10.5 LT C/L	D+100	10+680	10.5 RT C/L D+600
0	NFP BR		0- 400	Blk Si Tps
			400	NFP BR
10+620	10.5 RT C/L	D	10+700	C/L D
0	NFP BR		0- 100	Blk Si Tps
10+640	C/L	D	100- 800	Br Siy Sa Wet
0- 500	Blk Si Tps		800	NFP BR
500	NFP BR			
10+640	10.5 LT C/L	D-200	10+700	10.5 LT C/L D+2.30
0- 300	Blk Si Tps		0	NFP BR
300	NFP BR			
10+640	10.5 RT C/L	D-200	10+700	10.5 RT C/L D+900
0- 500	Blk Si Tps		0- 300	Blk Si Tps
500	NFP BR		300- 800	Br Sa Tr Si
			800	NFP BR
10+660	C/L	D	10+710	C/L D
0- 150	Fr Wat		0- 200	Blk Si Tps
150- 1.00	Br F To Med Sa W Si Wet		200- 1.40	Lt Br F Sa And Si Wet
1.00	NFP BR		1.40	NFP BR
10+660	10.5 LT C/L	D	10+710	10.5 LT C/L D+2.40
0- 100	Fr Wat		0	NFP BR
100- 1.30	Blk Amor Peat			
1.30- 2.50	Gry F To Med Sa Tr Si Wet		10+710	10.5 RT C/L D+800
2.50	NFP BR		0- 500	Blk Si Tps
			500	NFP BR
10+660	10.5 RT C/L	D+300	10+730	C/L D
			0	NFP BR

Highway 169 Connection

Datum Centre Line Pavement

10+730 10.5 LT C/L D-1.40
0- 800 Blk Si Tps
800 NFP BR

10+730 10.5 RT C/L D+900
0- 600 Blk Si Tps
600 NFP BR

10+750 C/L D
0 NFP BR

10+750 10.5 LT C/L D-1.20
0- 100 Blk Si Tps
100 NFP BR

10+750 10.5 RT C/L D-700
0 NFP BR

10+770 C/L D
0- 300 Blk Si Tps
300 NFP BR

10+770 10.5 LT C/L D+2.00
0 NFP BR

10+770 10.5 RT C/L D-1.50
0- 300 Blk Si Tps
300 NFP BR

10+780 C/L D
0- 500 Blk Si Tps
500 NFP BR

10+780 10.5 LT C/L D+1.80
0 NFP BR

10+780 10.5 RT C/L D-200
0- 800 Blk Si Tps
800 NFP BR

10+820 C/L D
0- 100 Blk Si Tps
100- 2.00 Comp Br Med Sa W Si Wet
2.00 NFP BR

10+870 C/L D
0- 300 Blk Si Tps
300- 1.10 Br F To Med Sa Tr Si Wet
1.10 NFP BR

10+870 10.8 LT C/L D-100
0- 100 Fr Wat
100- 1.50 Br F To Med Sa Tr Si Wet
1.50 NFP BR

10+870 10.8 RT C/L D+400
0- 200 Blk Si Tps
200- 1.00 Br F To Med Sa Tr Si Wet
1.00 NFP BR

10+920 C/L D
0- 600 Blk Si Tps
600- 1.20 Comp Dk Br Med Sa W Si Wet
1.20 NFP BR

10+970 C/L D
0 NFP BR

10+970 10.5 LT C/L D+700
0- 330 Asph
330- 400 D Gry Cr Sa And Gr Moist
400- 900 V D Br Med Sa W Gr Moist
900- 2.00 V D Br F Sa Tr Si Tr Gr Moist
2.00 NFP BR

10+970 10.8 RT C/L D+60

Highway 169 Connection

Datum Centre Line Pavement

0- 100	Br Say Si Tps		
100	NFP BR		
10+980	C/L	D	
0- 200	Br Say Si Tps		
200	NFP BR		
10+980	10.5 LT C/L	D+600	
0- 330	Asph		
330- 450	Gry Cr Sa And Gr		
450- 900	D Br F To Med Sa Tr Si Tr Gr Moist		
900- 1.50	D Br Med Sa Moist		
1.50	NFP RF		
10+980	10.8 RT C/L	D-1.60	
0- 300	Blk Si Tps		
300- 1.40	Br F To Med Sa Tr Si Wet		
1.40	NFP BR		
10+990	C/L	D	
0- 600	Comp Gry Cr Sa And Gr Moist		
600- 1.20	L Br F Sa Tr Si Moist		
1.20- 1.35	Comp Br Med Sa And Gr Moist		
1.35	NFP BR		
10+990	10.5 LT C/L	D+100	
0- 320	Asph		
320- 400	Gry Cr Sa And Gr		
400- 1.50	V D Br F To Med Sa W Gr Moist		
1.50- 2.00	L Blk Med Sa And Si Tr Org		
2.00	NFP RF		
10+990	10.8 RT C/L	D-2.10	
0- 100	Blk Si Tps		
100- 1.30	D Br F To Med Sa W Si Wet		
1.30	NFP BR		
11+010	C/L	D	
0- 175	Asph		
175- 450	D Gry Cr Sa W Gr Tr Si		
	%Passing L9445	SP-SM	
	19.0 mm = 100	Not Accep Gran 'A'	
	13.2 mm = 99*	*% Passing exceed	
	9.50 mm = 96*	max allowed	
	4.75 mm = 86*	Accep Gran 'B' Type I	
	1.18 mm = 66*		
	300 um = 29*		
	75 um = 6		
450- 1.80	Comp Br F To Med Sa Tr Gr Tr Si Moist		
	%Passing L9446	SP	
	26.5 mm = 100	Accep Gran 'B' Type I	
	4.75 mm = 98		
	1.18 mm = 92		
	300 um = 55		
	75 um = 5		
1.80- 3.00	V L Br Med Sa Moist		
3.00- 3.15	L Blk Med Sa		
3.15- 3.30	Blk Sa Tps		
3.30- 3.60	Comp Br Med Sa Tr Si		

Highway 169 Connection

Datum Centre Line Pavement

		%Passing	L9444	SP	425- 900	V D F to Med Sa Tr Gr Moist
		4.75 mm =	100		900- 1.65	V D Blk Med Sa W Org Moist
		1.18 mm =	96		1.65	NFP BR
		300 um =	69			
		150 um =	17			
		75 um =	5			
11+010	10.5 LT C/L	D			11+040 10.5 LT C/L	D-600
0- 180	Asph				0- 550	Gry Cr Sa And Gr
180- 450	Gry Cr Sa And Gr				550- 600	Comp Br Med Sa Moist
450- 900	Comp Med To Co Sa Tr Gr Moist				600- 1.20	L Br F Sa Tr Si Moist
900- 1.80	L Br F To Med Sa Tr Gr Moist				1.20- 2.70	V L Dk Br Med Sa W Gr Tr Org
1.80	NFP RF				2.70	NFP BR
11+010	10.8 RT C/L	D-3.00			11+040 10.5 RT C/L	D-2.10
0- 100	Fr Wat				0- 1.90	Lt Br F To Med Sa W Si Tr Gr OCC
100- 150	Blk Si Tps					Blds Moist
150- 1.50	Comp Br Med Sa W Si Wet				1.90	NFP BR
1.50	NFP BR				11+060	C/L D
					0- 310	Asph
					310- 450	Gry Cr Sa And Gr
					450- 860	V D Br F to Med Sa Tr Gr Moist
					860	NFP RF
					11+060 10.5 RT C/L	D-1.80
					0- 2.60	Comp To V D Br F To Med Sa W Si Tr
						Gr OCC Blds
					2.60	NFP VD
11+020	C/L	D			11+060 10.8 LT C/L	D-1.45
0- 260	Asph				0- 150	Blk Siy Sa Tps Moist
260- 450	Gry Cr Sa And Gr				150- 1.20	Br F Sa Tr Si Moist
450- 2.10	V D To Comp Br F To Med Sa Tr Gr				1.20- 4.80	Lt Br F Sa Tr Si Moist
	Moist					
2.10- 2.70	L Br Med Sa				11+060 14.8 LT C/L	D-3.30
2.70- 3.60	Comp Dk Br F To Med Sa Tr Org				0- 150	Blk Siy Sa Tps
	Moist				150- 1.20	D Lt Br F Sa Tr Si Moist
11+020	10.8 RT C/L	D-3.00			11+080 1.4 RT C/L	D
0- 300	Blk Si Tps					
300- 1.50	Comp Gry F To Med Sa W Si Wet					
1.50	NFP BR					
11+040	C/L	D				
0- 340	Asph					
340- 425	Gry Cr Sa And Gr					

Highway 169 Connection

Datum Centre Line Pavement

0- 350	Asph	9.50 mm = 97* max allowed
350- 450	Gry Cr Sa And Gr	4.75 mm = 86* Accep Gran 'B' Type I
450- 1.15	Br F To Med Sa Tr Gr Moist	1.18 mm = 60*
1.15	NFP RF	300 um = 23*
		75 um = 4
11+080 12.8 LT C/L D-2.60		400- 1.10 V D Br F To Med Sa Tr Gr Tr Si Moist
0- 100	Blk Si Tps	%Passing L9448 SP-SM
100- 1.50	Comp To D Br Med Sa W Si Moist	26.5 mm = 100 Accep Gran 'B' Type I
1.50	NFP BR	4.75 mm = 95
(Existing Ditch)		1.18 mm = 90
		300 um = 56
		75 um = 8
11+080 12.8 RT C/L D-2.90		1.10 NFP RF
0- 100	Blk Si Tps	
100- 500	Br Med Sa W Si Wet	11+110 10.5 LT C/L D-1.10
500	NFP BR	0- 100 Br Si Tps
		100- 300 Br F To Med Sa Tr Si
		300 NFP BR
		11+110 10.5 RT C/L D-1.05
		0- 100 Br Si Tps
		100- 1.00 Br F To Med Sa Tr Si
		1.00 NFP BR
		11+120 1.5 RT C/L D-30
		0- 310 Asph
		310- 400 Gry Cr Sa And Gr
		400- 900 D Br F To Med Sa Tr Gr Moist
		900- 1.35 D Br Med Sa Tr Gr
		1.35 NFP RF
		11+120 10.8 LT C/L D-1.50
		0 NFP BR
		(Existing Ditch)
11+110 1.5 RT C/L D		
0- 320	Asph	
320- 400	Gry Cr Sa W Gr Tr Si	
	%Passing L9447 SW	
	19.0 mm = 100 Not Accep Gran 'A'	
	13.2 mm = 99* ** Passing exceed	
		11+120 10.8 RT C/L D-1.40
		0- 100 Blk Si Tps

Highway 169 Connection

Datum Centre Line Pavement

100- 800 Br Med Sa W Si Wet
 800 NFP BR

11+130 1.5 RT C/L D-30
 0- 265 Asph
 265- 450 Gry Cr Sa And Gr
 450- 1.10 D Br F To Med Sa Tr Gr Moist
 1.10 NFP RF

11+130 10.8 LT C/L D-1.30
 0- 200 Br Med Sa W Si Wet
 200 NFP BR
 (Existing Ditch)

11+130 10.8 RT C/L D-900
 0- 200 Blk Si Tps
 200 NFP BR

WP 290-97-00 Highway 69
District 52, Huntsville
Swamp 1A
Station 10+085 - 10+250
Highway 169 Connection
Twp. of Freeman
Datum Centre Line Pavement

S1A-1 10+100 17.0 LT C/L D
0-150 Water
150-4.80 Blk Amor Peat
4.80-6.00 V Soft Gry Siy Cl Wet
6.00 NFP BR

S1A-5 10+150 16.5 LT C/L D
0-150 Water
150-5.10 Blk Amor Peat
5.10-6.00 Comp Gry Sa Tr Si Wet
6.00-7.50 Soft Gry Siy Cl Wet
7.50 NFP BR

S1A-2 10+100 C/L D
0-150 Water
150-4.55 Blk Amor Peat
w @ 2.15 = 1185%
w @ 3.65 = 510%
4.55-4.70 Gry F To Med Sa Wet
w @ 0.1 < = 28%
4.70 NFP BR

S1A-7 10+150 16.5 RT C/L D
0-200 Water
200-3.60 Blk Amor Peat
3.60-4.50 Comp Gry Sa Tr Si Wet
4.50-5.10 Soft Gry Siy Cl Wet
5.10 NFP BR

S1A-3 10+100 17.0 RT C/L D
0-150 Water
150-3.35 Blk Amor Peat
3.35 NFP BR

S1A-9 10+200 15.5 LT C/L D
0-250 Water
250-3.90 Blk Amor Peat
3.90-4.95 Soft Gry Siy Cl Wet
4.95 NFP BR

S1A-4 10+125 C/L D
0-150 Water
150-4.75 Blk Amor Peat
4.75-5.35 Comp Gry Sa W Cl Seams Wet
5.35 NFP BR

S1A-11 10+200 15.5 RT C/L D
0-300 Water
300-3.00 Blk Amor Peat
3.00-4.65 Soft Gry Siy Cl W Sa Seams Wet
4.65 NFP BR

WP 290-97-00 Highway 69

District 52, Huntsville

Swamp 1A

Station 10+085 - 10+250

Highway 169 Connection

Twp. of Freeman

Datum Centre Line Pavement

S1A-12	10+225	C/L	D
	0-200	Water	
	200-2.25	Blk Amor Peat	
	2.25-3.15	Soft Gry Siy Cl Wet	
	3.15	NFP BR	

S1A-13	10+250	15.0 LT C/L	D
	0-300	Water	
	300-500	Blk Amor Peat	
	500	NFP BR	

S1A-14	10+250	C/L	D
	0-300	Water	
	300	NFP BR	

S1A-15	10+250	15.0 RT C/L	D
	0-250	Water	
	250-550	Br Sa Tr Si Wet	
	550	NFP BR	

LOG OF BOREHOLE NO. S1A-6

PROJECT WP 290-97-00

OUR PROJECT 97TF088B

LOCATION Station 10+150, C/L, Highway 169 Connection, Twp. of Freeman BORING DATE 98.02.19

ENGINEER E. W.

BORING METHOD Continuous Flight Hollow Stem Augers

TECHNICIAN B.G.

SOIL PROFILE				SAMPLES			SHEAR STRENGTH C_u (kPa) +				LIQUID LIMIT W_L			GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	20 40 60 80				PLASTIC LIMIT W_p			
							DYNAMIC CONE PENETRATION x STANDARD PENETRATION TEST •				WATER CONTENT %			
							BLOWS/0.3M				W_p W W_L			
							20 40 60 80				10 20 30			
0	GROUND ELEVATION D													
0.20	Water													
	Peat Fibrous, Black													
1.5				1	SS	0						W=1117	⊙	
3.0				2	SS	0	+					W=1376	⊙	
4.20							+							
4.5	Sand Trace Silt Grey, Wet Compact			3	SS	12							⊙	
5.70														
6.0	Silty Clay Grey, Wet Soft			4	SS	1	3 +3					W=42	⊙	
7.50														
7.95	Sand Trace Silt Grey, Wet Compact			5	SS	4							⊙	
9.0														
	End Of Borehole Auger Refusal Probable Bedrock													
10.5														
12.0														
13.5														
15.0														
16.5														

NOTES:

1. N value is disturbed
2. + Number refers to sensitivity

CHECKED BY:

WP 290-97-00 Highway 69

District 52, Huntsville

Swamp 1B

Station 11+900 - 12+175

Highway 169 Connection, S-E Ramp

Twp. of Freeman

Datum Edge Pavement (E/P)

S1B-1	11+900	10.5 LT E/P	D
	0-200	Water	
	200-1.00	Blk Amor Peat	
	1.00	NFP BR	

S1B-6	11+950	2.5 LT E/P	D
	0-5.40	Blk Amor Peat	
	5.40-5.70	L Gry Sa Tr Si Wet	
	5.70	NFP BR	

S1B-2	11+900	2.5 LT E/P	D
	0-200	Water	
	200-1.30	Blk Amor Peat	
	1.30	NFP BR	

S1B-8	11+975	2.5 LT E/P	D
	0-250	Water	
	250-4.80	Blk Amor Peat	
	4.80-6.20	L Gry Sa Tr Si Tr Gr Wet	
	6.20	NFP BR	

S1B-3	11+900	5.5 RT E/P	D
	0-300	Water	
	300-1.65	Blk Amor Peat	
	1.65	NFP BR	

S1B-9	12+000	10.5 LT E/P	D
	0-4.20	Blk Amor Peat	
	4.20	NFP BR	

S1B-4	11+925	2.5 LT E/P	D
	0-300	Water	
	300-3.15	Blk Amor Peat	
	3.15	NFP BR	

S1B-10	12+000	2.5 LT E/P	D
	0-4.10	Blk Amor Peat	
	4.10-4.60	V L Gry Sa Tr Si Wet	
		w @ 4.30 = 20%	
	4.60-5.40	Soft Gry Layered Si And Cl Wet	
	5.40	NFP BR	

S1B-5	11+950	8.5 LT E/P	D
	0-5.55	Blk Amor Peat	
	5.55-7.80	L Gry Siy Sa Wet	
	7.80-8.70	V L Gry Si Wet	
	8.70-9.85	V Soft Gry Cl Wet	
	9.85	NFP BR	

WP 290-97-00 Highway 69

District 52, Huntsville

Swamp 1B

Station 11+900 - 12+175

Highway 169 Connection, S-E Ramp

Twp. of Freeman

Datum Edge Pavement (E/P)

S1B-11	12+000	5.5 RT E/P	D
	0-3.60	Blk Amor Peat	
	3.60-3.80	L Gry Sa W Si Wet	
	3.80-4.30	Soft Gry Cly Si Wet	
	4.30-4.50	L Gry Sa And Gr Wet	
	4.50	NFP BR	

S1B-12	12+025	2.5 LT E/P	D
	0-300	Water	
	300-3.00	Blk Amor Peat	
	3.00-3.20	L Gry Sa W Gr Tr Si Wet	
	3.20	NFP BR	

S1B-13	12+050	5.5 LT E/P	D
	0-200	Water	
	200-2.00	Blk Amor Peat	
	2.00	NFP BR	

S1B-14	12+050	2.5 RT E/P	D
	0-900	Blk Amor Peat	
	900	NFP BR	

S1B-15	12+050	10.5 RT E/P	D
	0-150	Water	
	150-300	Blk Amor Peat	
	300-1.00	L Br Sa W Gr Tr Si Wet	
	1.00	NFP BR	

S1B-16	12+075	2.5 RT E/P	D
	0-300	Water	
	300-3.40	Blk Amor Peat	
	3.40	NFP BR	

S1B-17	12+100	5.5 LT E/P	D
	0-200	Water	
	200-3.15	Blk Amor Peat	
	3.15-3.50	Gry F To Med Sa Tr Si Wet	
	3.50	NFP BR	

S1B-18	12+100	2.5 RT E/P	D
	0-250	Water	
	250-3.20	Blk Amor Peat	
	3.20	NFP BR	

S1B-19	12+100	10.5 RT E/P	D
	0-300	Water	
	300-3.40	Blk Amor Peat	
	3.40-3.70	L Gry Sa W Gr Tr Si Wet	
	3.70	NFP BR	

WP 290-97-00 Highway 69

District 52, Huntsville

Swamp 1B

Station 11+900 - 12+175

Highway 169 Connection, S-E Ramp

Twp. of Freeman

Datum Edge Pavement (E/P)

S1B-20	12+125	2.5 RT E/P	D
	0-300	Water	
	300-2.95	Blk Amor Peat	
	2.95-3.15	L Gry Sa Tr Si Wet	
	3.15-4.05	Soft Gry Cly Si Wet	
	4.05-4.70	L Gry Sa Tr Si Wet	
	4.70	NFP BR	

S1B-24	12+175	2.5 RT E/P	D
	0-300	Water	
	300-1.00	Blk Amor Peat	
	1.00	NFP BR	

S1B-21	12+150	5.5 LT E/P	D
	0-200	Water	
	200-2.70	Blk Amor Peat	
	2.70-3.40	L Gry Sa And Si Wet	
	3.40	NFP BR	

S1B-22	12+150	2.5 RT E/P	D
	0-2.30	Blk Amor Peat	
	2.30-3.20	Soft Gry Si And Cl Wet	
	3.20	NFP BR	

S1B-23	12+150	10.5 RT E/P	D
	0-200	Water	
	200-2.40	Blk Amor Peat	
	2.40-2.90	L Gry Sa And Si Wet	
	2.90	NFP BR	

LOG OF BOREHOLE NO. S1B-7

PROJECT WP 290-97-00

OUR PROJECT 97TF088B

LOCATION Station 11+950, E/P, Highway 169 Connection, S.E. Ramp, Twp. of Freeman

ENGINEER E. W.

BORING METHOD Continuous Flight Hollow Stem Augers

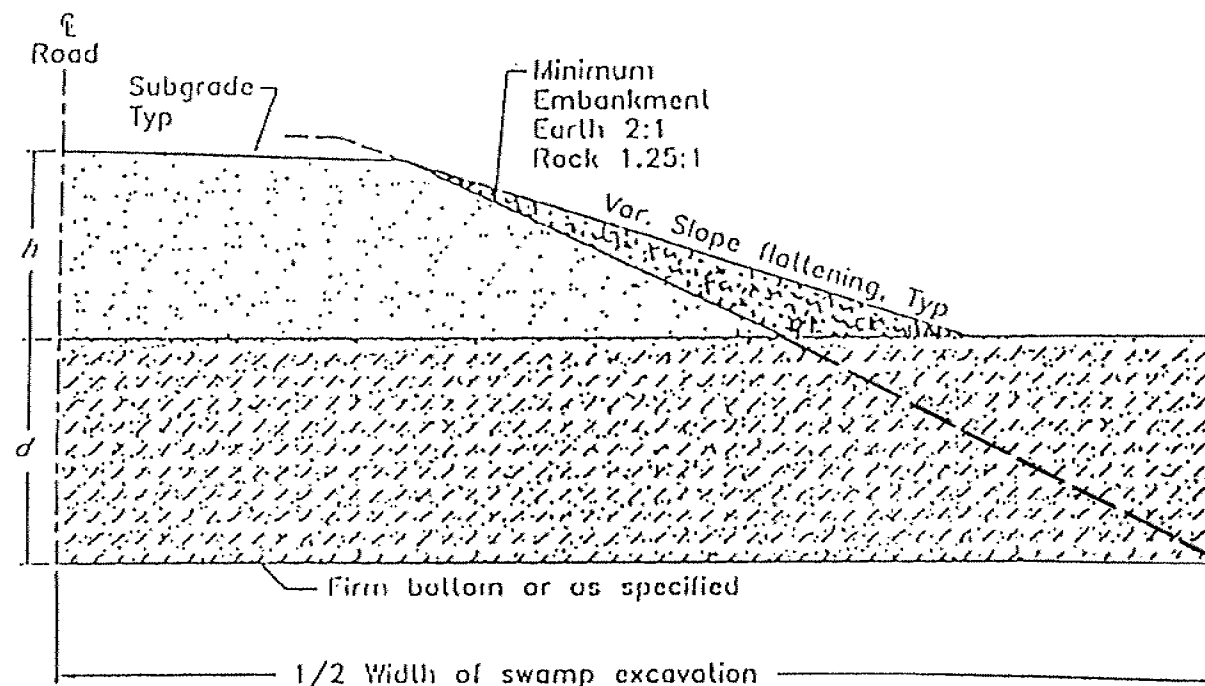
BORING DATE 98.02.20

TECHNICIAN L.G.

SOIL PROFILE				SAMPLES		SHEAR STRENGTH C_u (kPa) +				LIQUID LIMIT W_L			GROUNDWATER OBSERVATIONS AND REMARKS	
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3M N - VALUES	20 40 60 80				PLASTIC LIMIT W_P			
							DYNAMIC CONE PENETRATION x				WATER CONTENT W			
							STANDARD PENETRATION TEST •				W_P W W_L			
							BLOWS/0.3M				WATER CONTENT %			
							20	40	60	80	10	20		30
0	GROUND ELEVATION D						20	40	60	80	10	20	30	
	Peat Fibrous, Black													
1.5														
3.0				1	SS	0	+						W=950	⊙
4.5				2	SS	0	+						W=1040	⊙
5.40							+						⊙	
6.0	Sand With Silt Trace Gravel Brown, Wet Loose To Compact			3	SS	5								
7.20				4	SS	10								
7.5	Silt Grey, Wet Compact													
8.40	-----													
9.0	Layered Silt, Sand And Clay Soft			5	SS	4							⊙	
9.10														
	End Of Borehole Auger Refusal Probable Bedrock													
10.5														
12.0														
13.5														
15.0														
16.5														

NOTES:




CHECKED BY:



NOTES:

- A Height of fill is the vertical difference between top of subgrade and top of swamp elevation measured at new road centreline.
- B For divided roads with median < 10 metres, excavate swamp material full width.
- C For divided roads with median ≥ 10 metres, excavate swamp material to limits shown.
- D All dimensions are in millimetres or metres unless otherwise shown.

LEGEND:

-  Embankment materials as specified
-  Excavated swamp material
-  Excavate and backfill

h — Height of fill
 d — Depth of swamp

ONTARIO PROVINCIAL STANDARD DRAWING

EMBANKMENTS OVER SWAMP NEW CONSTRUCTION

1998 03 01

Rev

OPSD - 203.010 (MOD)



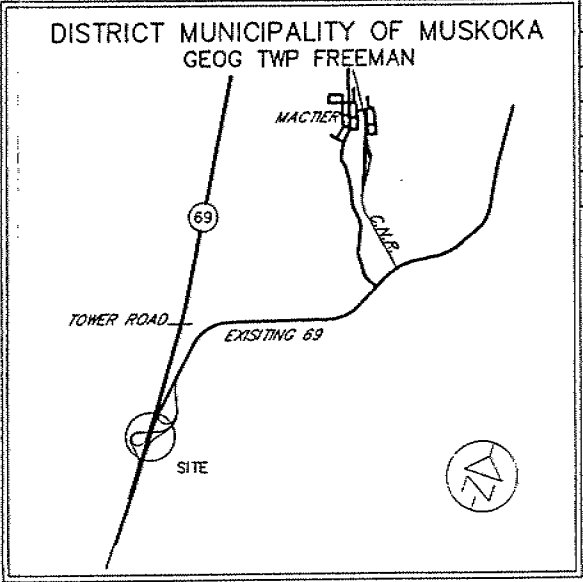
METRIC

PLATE No 790-69/3/0/47-0
DRAWING No 07900069008/047
CONT No C
WP No 290-97-00

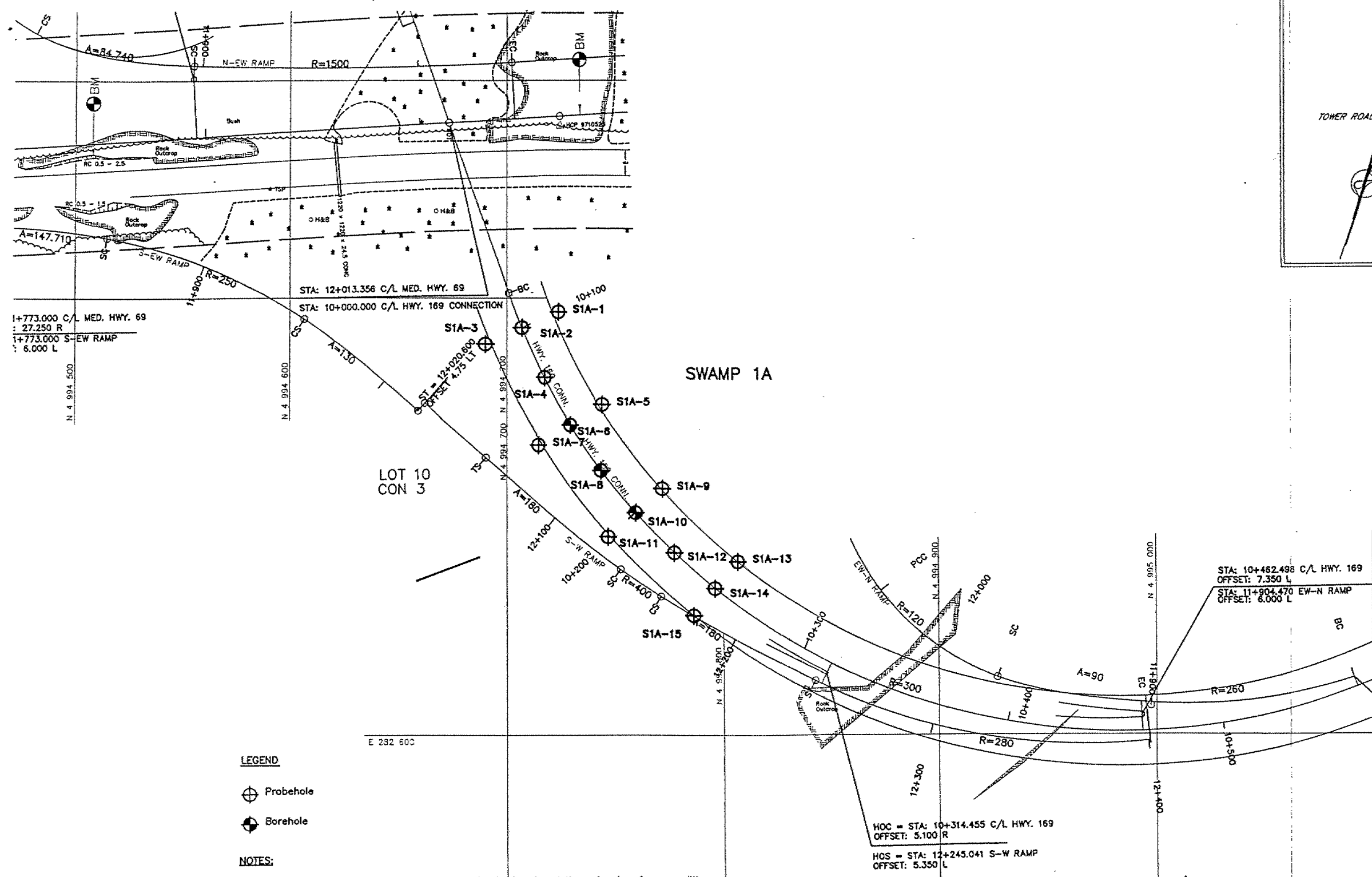


STA 9+900 TO STA 10+500
Survey 1997/12 Revised R

SHEET



KEY PLAN
(N.T.S.)

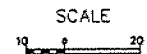


LEGEND

- Probehole
- Borehole

NOTES:

1. Refer to Log of Borehole and Probehole Sheets for description of subsurface conditions.
2. The boundaries between soil strata have been established only at borehole and probehole locations. The actual stratigraphy may vary from that shown at other points between boring.



MINISTRY OF TRANSPORTATION

KING'S HIGHWAY 69
HWY 169 CONNECTION

DISTRICT 52 HUNTSVILLE	REGION NORTHERN
GEOG. TWP. FREEMAN	DISTRICT MUNICIPALITY MUSKOKA

SWAMP 1A
BOREHOLE AND PROBEHOLE LOCATION PLAN

Peto MacCallum Ltd.
CONSULTING ENGINEERS
45 BURFORD ROAD, HAMILTON, ONTARIO L8E 3C8

DRAWN J. S.	DATE MAY 1998	SCALE 1 : 2000	JOB NO. 97TF0888	DRAWING NO. 1
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METRIC

PLATE No 790-69/8-0/47-3

DRAWING No 07900059008/C47

CONT No C

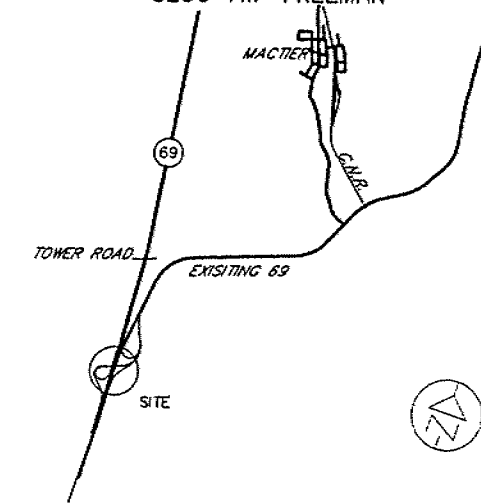
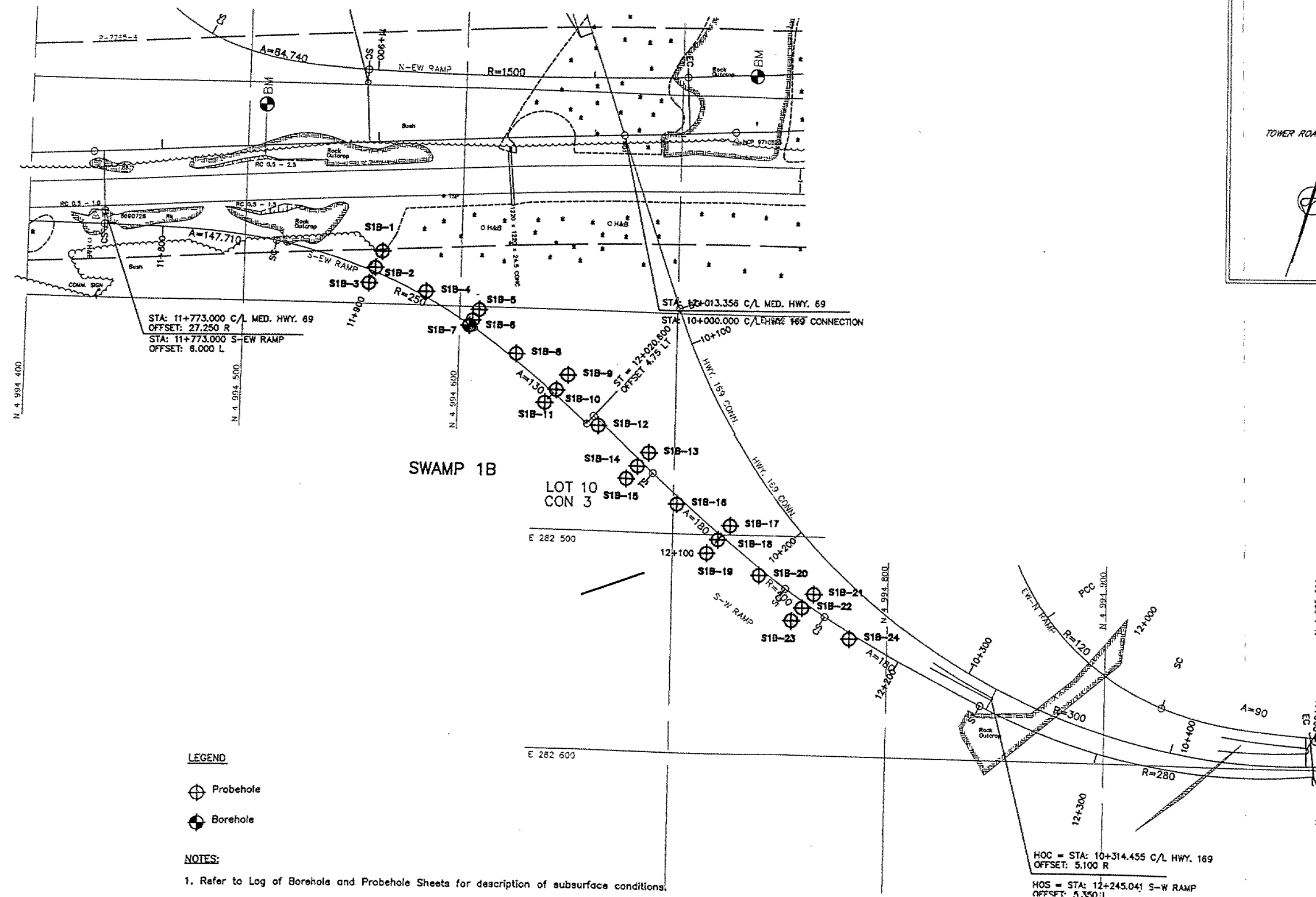
WP No 290-97-00



STA 11+700 TO STA 12+400

Survey 1997/12 Revised R

SHEET

DISTRICT MUNICIPALITY OF MUSKOKA
GEOG TWP FREEMANKEY PLAN
(N.T.S.)

LEGEND

⊕ Probehole

⊙ Borehole

NOTES:

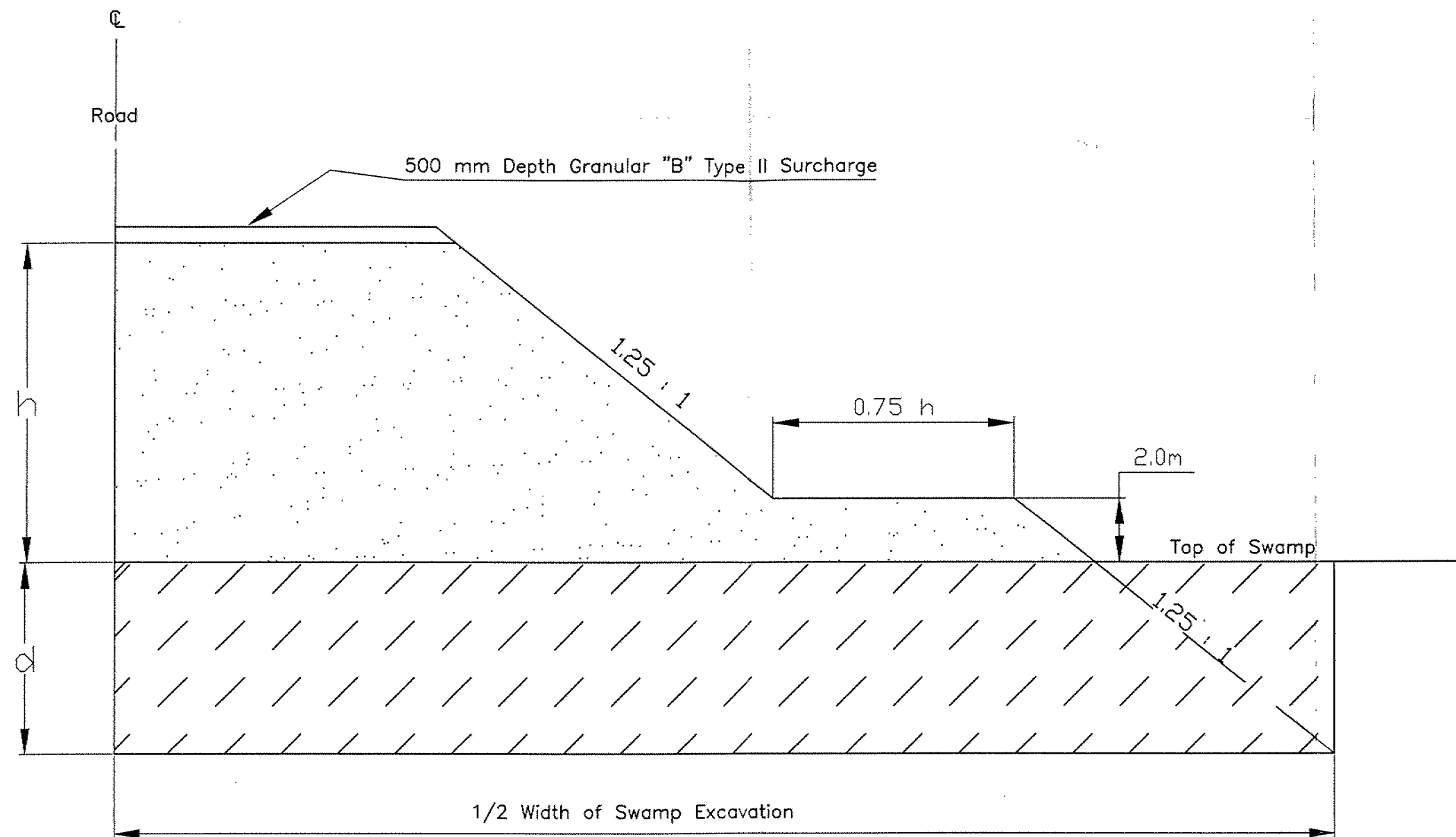
1. Refer to Log of Boreholes and Probehole Sheets for description of subsurface conditions.
2. The boundaries between soil strata have been established only at borehole and probehole locations. The actual stratigraphy may vary from that shown at other points between boring.

SCALE
10 0 20


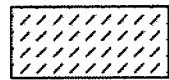
MINISTRY OF TRANSPORTATION

KING'S HIGHWAY 69
HWY 169 CONNECTIONDISTRICT
52 HUNTSVILLEREGION
NORTHERNGEOG. TWP.
FREEMANDISTRICT MUNICIPALITY
MUSKOKASWAMP 1B
BOREHOLE AND PROBEHOLE LOCATION PLANPeto MacCallum Ltd.
CONSULTING ENGINEERS
43 BURFORD ROAD, HAMILTON, ONTARIO L8E 3C6

DRAWN J. S.	DATE	SCALE	JOB NO.	DRAWING NO.
CHECKED E.W.	MAY 1998	1 : 2000	97TF088B	2
APPROVED				



LEGEND:

-  Embankment Materials
-  Excavation and Backfill

h - Height of fill (m)
D - Depth of swamp (m)

NOTES:

1. Excavate Peat / Soft Clay to 6.0 m depth or shallower where sand or bedrock encountered.

MINISTRY OF TRANSPORTATION

KING'S HIGHWAY 69

DISTRICT
52 HUNTSVILLE

REGION
NORTHERN

SWAMP TREATMENT

Peto MacCallum Ltd.
CONSULTING ENGINEERS
45 BURFORD ROAD, HAMILTON, ONTARIO L8E 3C8

DRAWN J. S.	DATE MAY 1998	SCALE N.T.S.	JOB NO. 97TF0888	DRAWING NO. 3
----------------	------------------	-----------------	---------------------	------------------



totten sims hubicki associates
Engineers Architects and Planners

300 Water Street, Whitby, Ontario, L1N 9J2
Phone: (905) 668-9363; Fax: (905) 668-0221
E-Mail: TSH@tsh.ca

FACSIMILE TRANSMITTAL

cc BFW / Pwk for A&S
Jun 5/98

No. of Pages Including Cover Sheet: 3

To: Turney Lee-Bun, P. Eng.

Fax #: (705) 734-9911

Paul Turner, P. Eng.

(905) 823-8503

Your File No. 97 TF 088

From: J. Wieczorek, P.Eng

TSH Project No. 42-35230

Date 3 June 1998

Originals to follow Yes X No

By Courier Mail Hand Please Pick Up

RE: Highway 69 Four Laning

Further to our recent telephone conversation, this fax will confirm our discussions with respect to the geotechnical component of the Advanced Structures Contract (Highway 69/ Highway 169 Interchange; Highway 69 / Lawson Bay Road Underpass).

1. HIGHWAY 69 / HWY 169 INTERCHANGE

- Due to the expanded limits of the Advanced Contract the additional **Borehole** logs are required for the locations as follow:
 - Ramp E-N.
 - Swamp, Sta. 12+080 to Sta. 12+120 Hwy 69 SBL
 - Existing Hwy 69 in the vicinity of the Interchange. Swamp excavations are proposed adjacent to the existing Hwy 69 rock fill, have you any concerns for the fill stability?
- We wish you to clarify proposed pavement structure at the Highway 169 Connection.

As per Pavement Design Report we used 50mm of Hot Mix over 150mm Granular 'A' and 150mm Granular 'B' at the Highway 169 Connection and 40+50mm Hot Mix and 150mm+150mm 'A+B' at the Interchange Ramps - all sections are in rock fill/cut. Ramp E-N bullnose is located at Sta. 10+422.804.

Further to our discussion, pavement to the west of the B/N will have a structure as per Interchange Ramps and the pavement to the east of the B/N will have only 1 lift of Hot Mix, as at the Hwy 169 Connection.

Anticipated limit of the construction to the east will be at Sta 11+140.

*****CONFIDENTIALITY NOTICE*****

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JUN-04-98 THU 08:06

TSH WHITBY

FAX NO. 305 668 0221

P.02/03

We also noted that the existing Highway 69 pavement has no less than 130mm of Hot Mix.

Propose recommendation will result with construction of the road section, approximately 700 m long, of the relatively thin pavement structure located between sections of substantially thicker pavement.

Traffic volume for the Highway 169 Connection is equal to the combined volume of the Ramp E-S and Ramp E-N and equal to the volume of future Highway 169.

- As part of the advanced contract existing swamp east of Highway 69 will be excavated to the bedrock and backfilled with the rock to the elevation $\pm 240.30m$, approximately 1m above existing swamp level. Proposed final rock fill will be approximately 8m high at the Hwy 69 Connection and 2.4m high at S-E Ramp. As recommended in your May 20, 1998 letter we applied deep swamp treatment as detailed on drawing 3 (attached) under Hwy 169 Connection Sta. 10+085 to Sta. 10+200.

However, we noted that the borehole logs show auger refusal (probable bedrock) at the depth below 6m everywhere, except boreholes No. S1A-5(7.5m), S1A-6(7.95m) Sta. 10+150; S1A-8(6.2m) Sta. 10+175 Hwy 169 Connection and S1B-5(9.85m), S1B-7(9.1m), Sta. 11+950; S1B-8(6.2m) Sta. 11+975 Ramp S-E.

We wish you to clarify proposed deep swamp treatment.

Can the length of the treatment for the Hwy 69 Connection be reduced, as proposed rock fill will be supported on the bedrock, except Sta. 10+150 to Sta. 10+175 ?

Is the treatment as per dwg.3 required for the Ramp S-E. Sta. 11+950 to Sta. 11+975?

Shall the proposed 500mm Granular 'B' Type II surcharge be included in the advanced contract?

2. HIGHWAY 69 - LAWSON BAY ROAD UNDERPASS

- Recommendations for the proposed detour pavement structure are required.

Please clarify Rock Fill Embankments recommendations in accordance with new OPSD 202.010

In order to properly address your recommendations and accommodate them in the design, we would appreciate a response prior to June 8, 1998.

We ask that you contact the undersigned should you have any concerns or require additional information.

Yours very truly,
totten slms hubicki associates

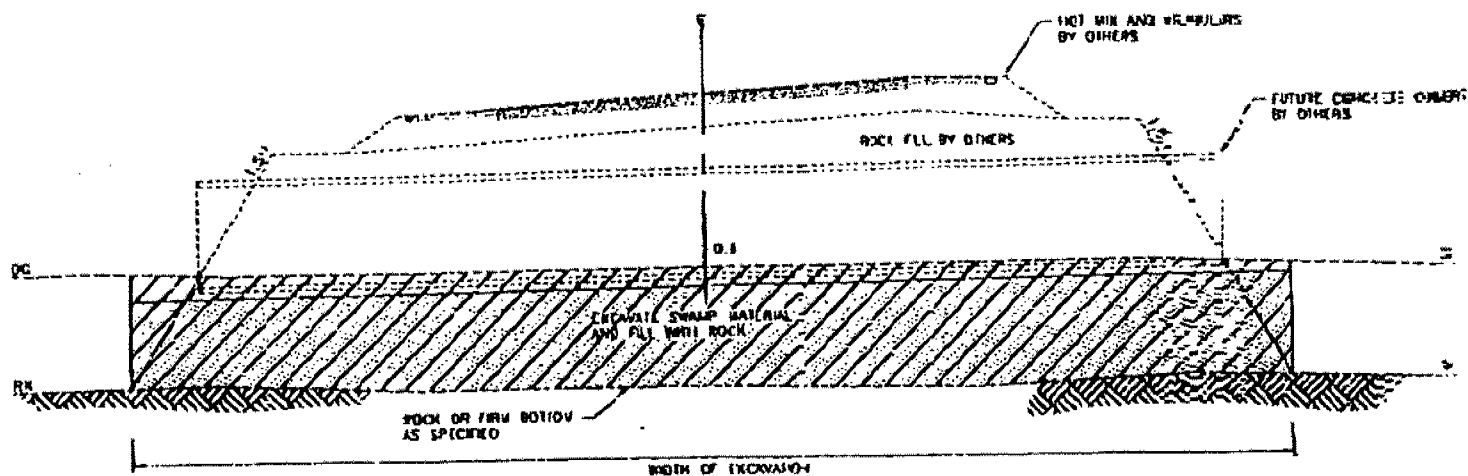
J. Wieczorek, P.Eng.,
Project Manager

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ROCK OR FIRM BOTTOM
AS SPECIFIED

5.0

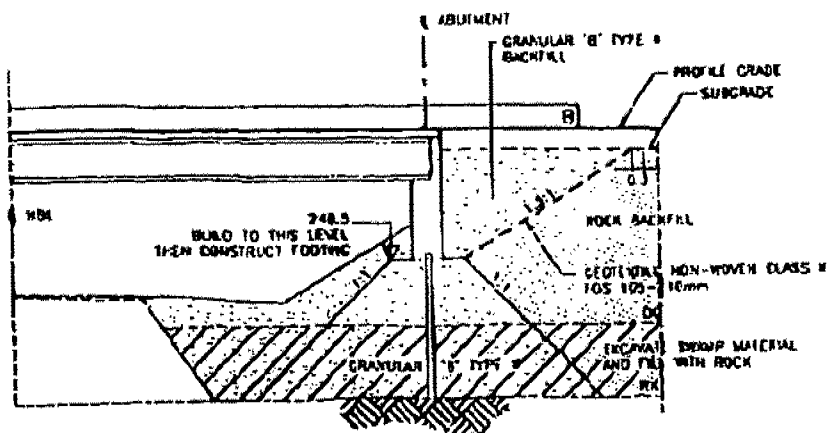


SWAMP EXCAVATION SECTION AT FUTURE CULVERT

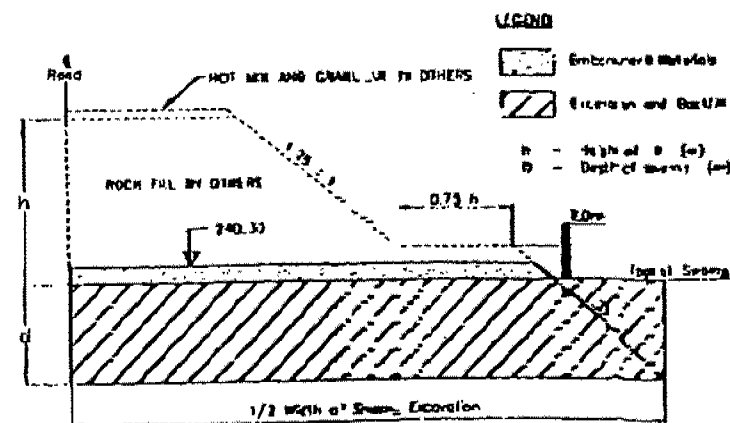
STA 12+110 HWY 69 SBL
STA 11+940 RAMP 5-E

DRAWING 3

SECTION



BACKFILL/GEOTEXTILE REQUIREMENTS AT HWY 169 STRUCTURE ABUTMENTS



NOTE: EXCAVATE PEAT/SOFT CLAY TO 8.0m BENTH ON
SHALLOWER WHERE SAND OR BEDROCK ENCOUNTERED

SWAMP TREATMENT

HWY 169 STA 10+35 TO STA 10+200

NTS

Peto MacCallum Ltd.
C O N S U L T I N G E N G I N E E R S

June 9, 1998

Our Ref: 97 TF 088
TSH Project 42-35230

Mr. J. Wieczorek, P.Eng.
Totten Sims Hubicki Associates
300 Water Street
Whitby, Ontario
L1N 9J2

Dear Mr. Wieczorek

MRC/TSH Joint Venture
Advanced Structures Contracts
Highway 69 Four Laning
W.P. 290-97-00

Further to your facsimile of June 3, 1998 and our telephone conversation of June 9, 1998 concerning the geotechnical components of the Advanced Structure Contract for Highway 69/Highway 169 Interchange and Highway 69/Lawson Bay Road Underpass, we present the following comments/recommendations for your consideration:

1. Highway 69/Highway 169 Interchange
 - (a) The additional log of test holes required due to the expanded limits of the Advanced Contract are presented in Appendix B of the Pavement Design Report (draft copy dated May 29, 1998).

An electronic copy of Appendix B was forwarded to your office by courier on June 5, 1998.
 - (b) The speed change lane for S-E ramp will require swamp excavation adjacent to existing Highway 69 rock fill embankment. For the anticipated height of fill, $h = 2.0$ m and depth of swamp, $d = 2.8$ m, OPSD 203.020 is recommended. It should be noted, however, that there is some potential for instability, subject to the actual geometry of excavation used in constructing the original fill.
 - (c) We have confirmed with Mr. P. Turner of McCormick Rankin Corporation that the design traffic volumes for the interchanges are applicable to the associated connection roads. Therefore, the pavement structure for Highway 169 Connection should be the same as the ramps, i.e. 40/50 hot mix and 150 A and 150 B.

...2

J. Wieczorek, June 9, 1998 P2

Our Ref: 97 TF 088

(d) With respect to excavation of existing swamp east of Highway 69:

- Highway 169 Connection 10+085 to 10+200

The recommended treatment involved removal of organics and/or very soft clay down to sand or rock (max. 6.0 m depth). Toe berms were recommended for stabilizing purposes cognizant of local silty clay layers which would be left in place beneath the sand.

Provided all materials are excavated to rock (max 6.0 m depth) the section requiring treatment in accordance with Drawing 3 may be reduced to 10 +125 to 10+200. The section from 10+085 to 10+125 may be treated in accordance with OPSD 203.010 (mod).

- 169/S-E Ramp 11+900 to 12+050

We note the maximum fill height through this section is less than 3.0 m. Therefore, treatment in accordance with OPSD 203.010 is applicable.

Treatment in accordance with Drawing 3 is not required at Station 11+950 to 11+975.

- It is not necessary to place the 500 mm Granular 'B' Type II surcharge during the contract, however, the surcharge must be placed above subgrade level ^{top} at least four months prior to final grading.

2. Highway 69/Lawson Bay Road Underpass

- It is understood a detour will be required for the existing road while the underpass structure is being constructed. Although the proposed alignment for the detour was not provided, it is assumed it will be relatively close to the proposed final alignment for Lawson Bay Road. The test holes indicate bedrock is exposed or occurs at shallow depth (typically less than 600 mm) throughout the alignment.

Cognizant of the anticipated very low volume and seasonal nature of the traffic, a 100 mm thickness of Granular 'A' should be sufficient for the proposed detour.

- OPSD 202.010 applies for rock fill embankments.

Peto MacCallum Ltd.
CONSULTING ENGINEERS

J. Wieczorek, June 9, 1998, P3

Our Ref: 97 TF 088

We trust you will find the foregoing satisfactory, however, should you have any further questions, please do not hesitate to contact this office.

Sincerely

PETO MacCALLUM LTD.



John F. Wright, Bsc.
Senior Geologist



Turney Lee-Bun. P.Eng.
Manager, Geotechnical Engineering

JFW:jlh

- 1 cc: Mr. J. Wieczorek, P.Eng., Totten Sims Hubicki Associates + Fax
- 1 cc: Mr. P. Turner, P.Eng., McCormick Rankin Corporation
- 1 cc: PML Barrie
- 1 cc: PML Hamilton
- 1 cc: PML Toronto



memorandum

To: Paul Lecoarer, P. Eng.
Senior Project Engineer
Planning and Design Section
Northern Region

1998 08 07

From: Pavements and Foundations Section
Room 223, Central Building
Downsview, Ontario

Re: Foundation Investigation Reports
G.W.P. 290-97-00
Hwy 169 Underpass, W.P. 398-97-00, Site 42-320
Lawson Bay Road Overpass, W.P. 403/404-97-00, Site 44-380 N&S
Rankin Lake Service Road Underpass, W.P. 409-97-00, Site 44-384
Hwy 69, District 52, Huntsville

We have conceptually reviewed the Foundation reports for the above projects produced by Peto MacCallum Ltd. Consulting Engineers for McCormick Rankin Corporation to determine the consultant's performance in providing the deliverables as would be required by MTO for similar consultant assignments. The accuracy of the subsurface information and the adequacy and technical aspects of the recommendations remain the responsibility of the consultant. The Ministry assumes no responsibility or liability for these aspects of the reports. These aspects will be reviewed in order to assess the consultant's performance in this assignment upon implementation of the recommendation in the design and upon review of the performance of the foundations for the completed project. Following are our comments:

General Comments for all the above Projects

All reports show WP 290-97-00 as the work project number. From the previous correspondence we understand that each project has been assigned individual project numbers. We think the work project number shown on the reports (WP 290-97-00) should be GWP 290-90-00. It should be corrected to avoid any confusion.

The reports are not signed by the MTO designated principals. The MTO policy requires that the Foundation reports should be signed by one of the MTO designated principal. The MTO designated principal of Peto MacCallum are Brian Gray or G.D. Bonner.

As mentioned in our previous memo dated 1998 06 09, the cross sections are very small. Also, profiles along the major highway showing the proposed grades of the highways, abutment locations and approach fills would be useful to understand the design arrangements.

The bar scale on the Key Plan is not correct

Hwy 169 Underpass, Site 42-320

As indicated in our memo of 1998 06 09, The bedrock elevation at this site is very shallow. The site may not meet the minimum pile length requirement for integral abutments. This should be verified by the MTO Structural Office.

Page 3, Paragraph 3: For pile driving it is recommended to use hammer which transfers at least 40 kJ energy. Normally for this type of soil condition 50 kJ hammer is recommended. However, to avoid any claims, the selection of the hammer may be left up to the Contractor.

The Cross Sections A-A and B-B shows the centre line of Hwy 169. It should be Hwy 69 (not Hwy 169).

Lawson Bay Road Overpass, Site 44-380 N&S

Please refer to the General Comments for all projects.

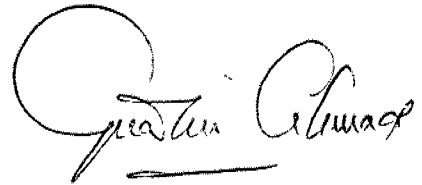
Rankin Lake Service Road Underpass, Site 44-384

Page 1, Introduction. Please verify if the noted Station 14+468 of Highway 69 chainage is correct. This does not match with the station shown on the drawing.

The skew of the foundation is greater than 20 degrees. According to the Integral Abutment Report, such structures should be considered for the integral abutment if rigorous analysis is carried out to account for the skew effects. Therefore, further analysis may be required to consider this structure for the integral abutment.

Page 3, Paragraph 2: For pile driving it is recommended to use hammer which transfers at least 40 kJ energy. Normally for this type of soil condition 50 kJ hammer is recommended. To avoid any claims, the selection of the hammer may be left up to the Contractor.

If you have any questions, please advise.

A handwritten signature in black ink, appearing to read 'K. Ahmad', with a large circular flourish at the beginning.

K. Ahmad, P. Eng
Foundation Engineer

For

T.C. Kim, P. Eng.
Senior Foundation Engineer

cc: P. Furst
I. Hussain
T. Kazmierowski



memorandum

To: Paul Lecoarer, P. Eng.
Senior Project Engineer
Planning and Design Section
Northern Region

1998 06 09

From: Pavements and Foundations Section
Room 223, Central Building
Downsview, Ontario

Re: Foundation Investigation Reports and Technical Review Package
G.W.P. 290-97-00
Hwy 169 Underpass, W.P. 398-97-00, Site 42-320
Lawson Bay Road Overpass, W.P. 403/404-97-00, Site 44-380 N&S
Rankin Lake Service Road Underpass, W.P. 409-97-00, Site 44-384
Hwy 69, District 52, Huntsville

We have conceptually reviewed the Foundation reports and the Technical Review Package for the above projects produced by Peto MacCallum Ltd. Consulting Engineers for McCormick Rankin Corporation to evaluate the performance of the Consultant. Since, we were given a very short time to review, we have not reviewed the report in detail. The accuracy of the subsurface information and the technical recommendations remain the responsibility of the consultant. Following are our comments:

Hwy 169 Underpass

Foundation:

- The bedrock elevation is very shallow. The site may not meet the minimum pile length requirement for integral abutments. This should be checked out with the Structural Office.

Drawing:

Drawing No. 1, dated April 1998

- Existing Hwy 169 should be shown on the Key Plan.
- Proposed foundation location should be shown on the plan.
- A large scale profile with a proposed grade of Hwy 169 should be provided.

- N-values and soil description should be provided on the cross sections and profiles.
- The cross sections are very small. When the drawing will be reduced to half size for the contract package, then it would not be legible. The cross sections should be produced in large scale. There is enough room on the drawing to draw cross sections in large scale.

Logs:

- For the borehole locations it is preferable to have Northing and Eastings instead of stations and offsets.

Lawson Bay Road Overpass

Drawing:

Drawing No. 1, Job No. 97TF088A, dated March 1998

- Proposed foundation location should be shown on the plan.
- Locations of the boreholes should be shown by coordinates, instead of stations and offset.
- N-values and soil description should be provided on the cross sections and profiles.
- The cross sections are very small. When the drawing will be reduced to half size for the contract package, then it would not be legible. The cross sections should be drawn in large scale.

Rankin Lake Service Road Underpass

Foundations

- Foundation Design Report, Page 3, Last Paragraph. It is recommended to use loose sand to fill the pre-augured holes. Just loose sand is not enough. It should be uniformly graded (Ottawa Sand) or equivalent. The Ministry has specification for the grain size distribution for Ottawa Sand.
- The denseness of the material described on the borehole logs do not agree with the Standard Penetration test results, N-values.

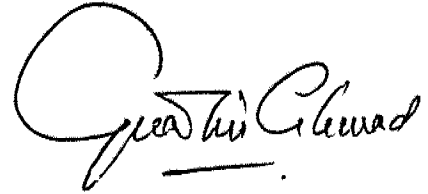
Drawing:

Drawing No. 1, Job No. 97TF088A, dated April 1998

- Proposed foundation locations should be shown on the plan.
- Locations of the boreholes should be shown by coordinates, instead of stations and offset.
- N-values and soil description should be provided on the cross sections and profiles.

- The cross sections are very small. When the drawing will be reduced to half size for the contract package, then it would not be legible. The cross sections should be produced in large scale.

If you have any questions, please advise.

A handwritten signature in black ink, appearing to read 'K. Ahmad', with a horizontal line underneath the name.

K. Ahmad, P. Eng
Foundation Engineer

For

T.C. Kim, P. Eng.
Senior Foundation Engineer

cc: P. Furst
I. Hussain
T. Kazmierowski