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DIST. 52 REGION

W.P. No. 407-97-01
& WP: 290-97-00

CONT. No.

W. O. No.

STR. SITE No. 44-382

HWY. No. 69

LOCATION Airport Rd. Underpass

No of PAGES - —

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

PetoMacCallum Ltd.
CONSULTING ENGINEERS

FOUNDATION INVESTIGATION REPORT
FOR
AIRPORT ROAD UNDERPASS
W.P. 407-97-01
G.W.P. 290-97-00, SITE 44-382
HIGHWAY 69, DISTRICT 52
HUNTSVILLE, ONTARIO

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Job No. 97TF088H
Geocres No. 31E-135

August, 1999

PetoMacCallum Ltd.
CONSULTING ENGINEERS

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Peto MacCallum Ltd.
CONSULTING ENGINEERS

FOUNDATION INVESTIGATION REPORT

For
Airport Road Underpass
W.P. 407-97-01
G.W.P. 290-97-00, Site 44-382
Highway 69, District 52, Huntsville

INTRODUCTION

This report summarizes the results of the foundation investigation carried out for construction of the proposed Highway 69 underpass at Airport Road (Station 20+198 Highway 69 chainage).

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

SITE DESCRIPTION

The site is located about 14 km north of MacTier and about 750 m west of the existing Highway 69 alignment. The proposed interchange will connect the existing Highway 69 (future Highway 169 south) and Airport Road with the proposed new four-lane section of Highway 69. At the underpass, Airport Road will run east-west.

The bridge location is presently a wooded/brush-covered area. The ground surface slopes down towards the west. Bedrock outcrops are evident within the bridge site.

The area is part of the Precambrian Laurentian peneplane. In general, the topography is relatively flat but quite irregular in detail with many small lakes separated by rocky ridges. 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.

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

INVESTIGATION PROCEDURES

The fieldwork was carried out on October 26, 1998 and comprised eight boreholes (boreholes 382R-1 to 382R-8) and 17 rock probes (RP1 to RP17) put down at the locations shown on Drawing 1. The information obtained from four boreholes (boreholes 382-6, 382-8, 382-9 and 382-10) drilled during an earlier investigation at the preliminary bridge alignment (March 1998) was used to supplement the current data.

Six boreholes were drilled at the proposed abutment/pier foundation locations to refusal on bedrock/inferred bedrock at depths of 0 to 900 mm. Two of these boreholes were extended an additional 2.9 and 3.3 m into the bedrock using NQ rock coring equipment; one of the previous boreholes was also cored into rock. The remaining boreholes and the rock probes were drilled to refusal on bedrock/inferred bedrock at depths of 0 to 840 mm.

The boreholes were advanced using continuous flight solid stem augers, powered by a track-mounted CME-55 drillrig, supplied and operated by a specialist drilling contractor, working under the full-time supervision of a member of our engineering staff. The groundwater conditions in the boreholes were closely monitored during the course of the fieldwork.

The recovered rock core samples were returned to our laboratory for detailed visual examination and classification. Selected samples of the 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, rock core descriptions and groundwater observations. Stratigraphic profiles prepared from the borehole data are presented on Drawing 1.

The stratigraphy revealed in the boreholes generally comprised a veneer of topsoil, sand, sand/silt and/or sand and gravel overlying bedrock. Bedrock was exposed at several locations. The strata encountered are summarized below.

Topsoil

Topsoil was encountered surficially in boreholes 382R-3, 4, 5, 7 and 8 as well as boreholes 382-6, 8 and 10. The topsoil layer was 130 to 300 mm thick and comprised dark brown to black silty sand. It mantled bedrock/inferred bedrock in boreholes 382R-3, 5 and 8 as well as boreholes 382-8 and 10.

Inorganic Overburden

A discontinuous layer of silty sand to sand and silt was encountered surficially in boreholes 382R-1 and 2, and below the topsoil in boreholes 382R-7and 382-6. Silty sand and gravel with cobbles was encountered in borehole 382R-4. The sand/silt/gravel layer was 210 to 840 mm thick. It mantled bedrock/inferred bedrock in each borehole.

Bedrock

Bedrock was exposed surficially at the locations of boreholes 382R-6 and 382-9 and at six probe locations. Bedrock or inferred bedrock was contacted below the topsoil/overburden at depths of up to 900 mm in the remaining testholes.

The bedrock/inferred bedrock elevations are summarized on Table I. The bedrock surface ranges from elevation 246.2 at the west approach to elevation 258.2 at the east approach, and generally follows the ground surface topography. The bedrock elevations inferred from the rock probes were generally consistent with the rock elevations revealed at the adjacent borehole locations.

A description of the rock cores recovered from boreholes 382R-4, 382R-5 and 382-8 is provided on Table II. In general, the bedrock consists of biotite migmatite in boreholes 382R-4 and 382-8, granitic gneiss in borehole 382R-5. Core recovery ranged from 92 to 100% (76% in one run from borehole 382R-4 due to equipment problems). The RQD ranged from 65 to 100%, 0% in the upper 2.3 m in borehole 382R-4, primarily due to equipment malfunction. The rock was fair to excellent quality.

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

Borehole No.	Depth (m)	Unconfined Compressive Strength (MPa)
382R-4	3.0	44.9
382R-5	1.6	31.8
382-8	0.3	54.2

Groundwater

Free water was not observed in the boreholes during or upon completion of drilling/coring. Observed groundwater levels are subject to seasonal fluctuations and rainfall patterns.

CLOSURE

The fieldwork was carried out under the supervision of M. Rapsey. The equipment was supplied by Long-Year Canada Inc.

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

Yours very truly

Peto MacCallum Ltd.

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

Brian R. Gray, M.Eng., P.Eng.
Vice-President
Geotechnical and
Geo-Environmental Services

MRA:mma

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Our Ref: 97TF088H

TABLE I

BEDROCK/INFERRED BEDROCK ELEVATIONS
W.P. 407-97-01, Site No. 44-382

TESTHOLE NO.	STATION AND OFFSET	GROUND ELEVATION	DEPTH TO ROCK (mm)	INFERRED ROCK ELEVATION
West Approach				
BH 382R-1	9+940.0 6.3 m LT	247.20	750	246.45
BH 382R-2	9+940.0 6.3 m RT	247.00	840	246.16
West Abutment				
RP1	9+957.5 6.3 m LT	251.99	50	251.94
BH 382R-3	9+960.0 6.3 m LT	251.96	300	251.66
RP2	9+962.5 6.3 m LT	252.01	800	251.21
RP3	9+960.0 C/L	251.96	300	251.66
RP4	9+957.5 6.3 m RT	252.61	0	252.61
BH 382R-4	9+960.0 6.3 m RT	252.41	900	251.51
RP5	9+962.5 6.3 m RT	252.49	400	252.09
RP6	9+960.0 8.8 m RT	252.59	400	252.19
Centre Pier				
BH 382-6	9+999.5 14 m LT	254.49	410	254.08
RP7	9+997.5 6.3 m LT	254.49	0	254.49
BH 382R-5	10+000.0 6.3 m LT	254.46	180	254.28
RP8	10+002.5 6.3 m LT	255.07	0	255.07
RP9	10+000.0 C/L	254.95	0	254.95
RP10	9+997.5 6.3 m RT	255.60	100	255.50
BH 382R-6	10+000.0 6.3 m RT	256.47	0	256.47
RP11	10+000.0 8.8 m RT	256.47	0	256.47
East Abutment				
RP12	10+034.5 6.3 m LT	256.39	300	256.09
BH 382R-7	10+037.0 6.3 m LT	256.39	540	255.85
RP13	10+039.5 6.3 m LT	256.49	540	255.95
BH 382-8	10+034.5 3.0 m LT	256.64	130	256.51
RP14	10+037.0 C/L	257.16	0	257.16
RP15	10+034.5 6.3 m RT	256.32	840	255.48
BH 382R-8	10+037.0 6.3 m RT	256.54	300	256.24
RP16	10+039.5 6.3 m RT	256.56	840	255.72
RP17	10+037.0 8.8 m RT	256.50	760	255.74
East Approach				
BH 382-9	10+054.2 15.0 m LT	258.17	0	258.17
BH 382-10	10+053.5 3.0 m RT	257.23	130	257.10

Our Ref: 97TF088H

TABLE II

ROCK CORE DESCRIPTION
WP 407-97-01, Site No. 44-382

CORE RECOVERY					CORE DESCRIPTION	
BOREHOLE	CORE NO.	DEPTH (m)	RECOVERY (%)	RQD (%)	DEPTH (m)	DESCRIPTION
382R-4	1 2 3 4	0.99 – 1.52 1.52 – 2.29 2.29 – 3.20 3.20 – 4.20	92 76* 100 100	0 0* 75 100	0.90 – 4.20	**BIOTITE MIGMATITE**, banded grey and black, fine to medium crystalline; medium to high strength; slightly to moderately weathered in upper 1 m becoming unweathered; very close to close spaced flat partings in upper 1 m becoming close to moderate, rough planar, tight, separating on mica schistocity, occ. vertical partings, oxidized to slightly altered; very poor to 2.3 m becoming fair to excellent quality.
382R-5	1 2	0.18 – 1.70 1.70 – 3.05	98 100	65 83	0.18 – 3.05	**GRANITIC GNEISS**, grey fine to medium crystalline with occ. layers of quartz pegmatite, coarse crystalline; medium to high strength; unweathered; close to moderate spaced flat to dipping partings, rough planar, tight, separating on mica schistocity, occ. vertical partings, oxidized to slightly altered; fair to good quality.
382-8	1 2	0.13 - 1.65 1.65 - 3.18	98 98	94 98	0.13 - 3.18	**BIOTITE MIGMATITE**, light grey, slightly banded biotite migmatite (stronger banding at 1.65 m), high strength; close to moderate spaced discontinuities; excellent quality

* Low Recovery and RQD due to equipment malfunction

RQD = Rock Quality Designation

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 0.3 m INTO THE SUBSOIL. DRIVEN BY MEANS OF A 63.5 kg HAMMER FALLING FREELY A DISTANCE OF 0.76 m.

DYNAMIC PENETRATION RESISTANCE: - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 51 mm, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS. 0.3 m 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

Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL		

▲/△ - UNDISTURBED AND REMOULDED SHEAR STRENGTH DETERMINED FROM IN SITU VANE TEST.

■ - UNDRAINED SHEAR STRENGTH DETERMINED FROM POCKET PENETROMETER TEST.

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LOG OF BOREHOLE NO. 382R-1

N 5 012 116
E 278 740

PROJECT W. P. 407-97-01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Airport Road Underpass, Site 44-382
LOCATION Station 9+940 (Highway 141) 6.3m Lt
BORING METHOD Continuous Flight Solid Stem Augers

OUR PROJECT 97TF088H
BORING DATE October 26, 1998
ENGINEER M. R. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES	GROUNDWATER OBSERVATIONS AND REMARKS
0	GROUND ELEVATION 247.20		247				
	SAND AND SILT : Brown sand and silt with gravel and cobbles						
0.75			246				
	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 0.75m. PROBABLE BEDROCK.						Upon completion of augering, no free water, no cave.
1.5							
3.0							
4.5							
6.0							
7.5							
9.0							
10.5							
12.0							
13.5							
15.0							
16.5							

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M
20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT %
10 20 30

NOTES:

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LOG OF BOREHOLE NO. 382R–2

N 5 012 105
E 278 746

PROJECT W. P. 407–97–01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Airport Road Underpass, Site 44–382
LOCATION Station 9+940 (Highway 141) 6.3m Rt
BORING METHOD Continuous Flight Solid Stem Augers

OUR PROJECT 97TF088H
BORING DATE October 26, 1998 ENGINEER M. R. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	SOIL PROFILE: DESCRIPTION	LEGEND	ELEVATION	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m N – VALUES	SHEAR STRENGTH C_u ▲ / DYNAMIC CONE PENETRATION x / STANDARD PENETRATION TEST ● BLOWS/0.3M (20 40 60 80)	LIQUID LIMIT W_L / PLASTIC LIMIT W_P / WATER CONTENT W (W_P W W_L) / WATER CONTENT % (10 20 30)	GROUNDWATER OBSERVATIONS AND REMARKS
0	GROUND ELEVATION 247.00								
	SAND AND SILT : Brown sand and silt with gravel and cobbles		246						Upon completion of augering, no free water, no cave.
0.84	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 0.84m. PROBABLE BEDROCK.								
1.5									
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. 382R–3

N 5 012 125
E 278 758

PROJECT W. P. 407–97–01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Airport Road Underpass, Site 44–382
LOCATION Station 9+960 (Highway 141) 6.3m Lt
BORING METHOD Continuous Flight Solid Stem Augers

OUR PROJECT 97TF088H
BORING DATE October 26, 1998 ENGINEER M. R. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N – VALUES	SHEAR STRENGTH C_u ▲ / DYNAMIC CONE PENETRATION x / STANDARD PENETRATION TEST ● BLOWS/0.3M (20 40 60 80)	LIQUID LIMIT W_L / PLASTIC LIMIT W_P / WATER CONTENT W (W_P — W — W_L) WATER CONTENT % (10 20 30)	GROUNDWATER OBSERVATIONS AND REMARKS
0	GROUND ELEVATION 251.96								
0.30	TOPSOIL : Dark brown silty sand		251						Upon completion of augering, no free water, no cave.
	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 0.30m. PROBABLE BEDROCK.								
1.5									
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. 382R–4

N 5 012 114
E 278 763

PROJECT W. P. 407–97–01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Airport Road Underpass, Site 44–382
LOCATION Station 9+960 (Highway 141) 6.3 m Rt
BORING METHOD Continuous Flight Hollow Stem Augers

OUR PROJECT 97TF088H
BORING DATE October 26, 1998 ENGINEER M. R. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N – VALUES	SHEAR STRENGTH C_u ▲ / DYNAMIC CONE PENETRATION × / STANDARD PENETRATION TEST ● BLOWS/0.3M (20 40 60 80)	LIQUID LIMIT W_L / PLASTIC LIMIT W_P / WATER CONTENT W (W_P W W_L) WATER CONTENT % (10 20 30)	GROUNDWATER OBSERVATIONS AND REMARKS
0	GROUND ELEVATION 252.41								
0.15	TOPSOIL : Dark brown silty sand		252						Upon completion of augering, no free water, no cave.
0.90	SAND AND GRAVEL : Brown silty sand and gravel with cobbles and boulders			1	RC		620		* Equipment malfunction
1.5			251						
	BEDROCK : Biotite Migmatite			2	RC		770		
			250						
3.0				3	RC		910		
			249						
4.20				4	RC		1000		
	BOREHOLE TERMINATED AT 4.20m.		248						
4.5							RUN (mm) / RECOVERY (%) / RQD (%) / 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. 382R–5

N 5 012 143
E 278 794

PROJECT W. P. 407–97–01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE — OUR PROJECT 97TF088H
SITE Airport Road Underpass, Site 44–382
LOCATION Station 10+000 (Highway 141) 6.3 m Lt — BORING DATE October 26, 1998 — ENGINEER M. R. Anderson
BORING METHOD Continuous Flight Solid Stem Augers & NQ Rock Coring — TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m N-VALUES
	GROUND ELEVATION 254.46					
0						
0.15	TOPSOIL : Dark brown silty sand		254			
	BEDROCK : Granitic Gneiss			1	RC	
1.5			253			
				2	RC	
3.05			252			
3.0	BOREHOLE TERMINATED AT 3.05m.		251			
4.5						
6.0						
7.5						
9.0						
10.5						
12.0						
13.5						
15.0						
16.5						

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M: 20 40 60 80

RUN (mm)	RECOVERY (%)	ROD (%)	DRILL WATER RETURN (%)
1525	98	65	100
1345	100	83	100

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT %: 10 20 30

GROUNDWATER OBSERVATIONS AND REMARKS

Upon completion of augering, no free water, no cave.

NOTES:

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LOG OF BOREHOLE NO. 382R–6

N 5 012 131
E 278 799

PROJECT W. P. 407–97–01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Airport Road Underpass, Site 44–382
LOCATION Station 10+000 (Highway 141) 6.3m Rt
BORING METHOD Continuous Flight Solid Stem Augers
OUR PROJECT 97TF088H
BORING DATE October 26, 1998
ENGINEER M. R. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES	SHEAR STRENGTH C_u ▲ / DYNAMIC CONE PENETRATION x / STANDARD PENETRATION TEST ● BLOWS/0.3M (20 40 60 80)	LIQUID LIMIT W_L / PLASTIC LIMIT W_P / WATER CONTENT W (W_P W W_L) WATER CONTENT % (10 20 30)	GROUNDWATER OBSERVATIONS AND REMARKS
0	GROUND ELEVATION 256.47								
	BEDROCK AT SURFACE :		256						
1.5									
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. 382R–7

N 5 012 159
E 278 826

PROJECT W. P. 407–97–01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Airport Road Underpass, Site 44–382
LOCATION Station 10+037 (Highway 141) 6.3m Lt
BORING METHOD Continuous Flight Solid Stem Augers

OUR PROJECT 97TF088H
BORING DATE October 26, 1998 ENGINEER M. R. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N – VALUES	GROUNDWATER OBSERVATIONS AND REMARKS
0	GROUND ELEVATION 256.39						
0.15	TOPSOIL : Dark brown silty sand		256				
0.54	SAND : Dark brown silty sand with gravel		255				
	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 0.54m. PROBABLE BEDROCK.						Upon completion of augering, no free water, no cave.

SHEAR STRENGTH c_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M
20 40 60 80

LIQUID LIMIT ——— W_L
PLASTIC LIMIT ——— W_P
WATER CONTENT ——— W
W_P W W_L
WATER CONTENT %
10 20 30

NOTES:

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PetoMacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 382R-8

N 5 012 148
E 278 832

PROJECT W. P. 407-97-01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Airport Road Underpass, Site 44-382
LOCATION Station 10+037 (Highway 141) 6.3m Rt
BORING METHOD Continuous Flight Solid Stem Augers

OUR PROJECT 97TF088H
BORING DATE October 26, 1998
ENGINEER M. R. Anderson
TECHNICIAN M. Rapsey

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES	GROUNDWATER OBSERVATIONS AND REMARKS
0	GROUND ELEVATION 256.54						
0.30	TOPSOIL : Dark brown silty sand		256				Upon completion of augering, no free water, no cave.
	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 0.30m. PROBABLE BEDROCK.						
1.5							
3.0							
4.5							
6.0							
7.5							
9.0							
10.5							
12.0							
13.5							
15.0							
16.5							

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ——— W_L
PLASTIC LIMIT ——— W_P
WATER CONTENT ——— W
W_P W W_L
WATER CONTENT % 10 20 30

NOTES:

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CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 382–6

N 5 012 150
E 278 790

PROJECT W.P. 407–97–01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Airport Road Underpass, Site 44–382
LOCATION Station 9+999.5 (Airport Road) 14m Lt.
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE March 5, 1998
OUR PROJECT 97TF088A
ENGINEER A. D. Vanin
TECHNICIAN B. Garlick

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N – VALUES
0	GROUND ELEVATION 254.49					
0.20	TOPSOIL : Black silty sand		254			
0.41	SAND : Dark reddish–brown silty sand, trace of gravel, moist					
	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 0.41m. PROBABLE BEDROCK.					
1.5						
3.0						
4.5						
6.0						
7.5						
9.0						
10.5						
12.0						
13.5						
15.0						
16.5						

SHEAR STRENGTH C_u ▲
DYNAMIC CONE PENETRATION x
STANDARD PENETRATION TEST ●
BLOWS/0.3M
20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ____ W
W_P W W_L
WATER CONTENT %
10 20 30

GROUNDWATER OBSERVATIONS AND REMARKS

Upon completion of augering, no free water, no cave.

NOTES:

CHECKED BY:

PetoMacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 382-8

N 5 012 155
E 278 826

PROJECT W.P. 407-97-01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Airport Road Underpass, Site 44-382
LOCATION Station 10+034.5 (Airport Road) 3.0m Lt.
BORING METHOD Continuous Flight Hollow Stem Augers & NQ Rock Coring
BORING DATE March 5, 1998
OUR PROJECT 97TF088A
ENGINEER A. D. Vanin
TECHNICIAN B. Garlick

DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/0.3m N - VALUES	SHEAR STRENGTH C_u ▲ / DYNAMIC CONE PENETRATION x / STANDARD PENETRATION TEST • BLOWS/0.3M (20 40 60 80)	LIQUID LIMIT W_L / PLASTIC LIMIT W_P / WATER CONTENT W (W_P W W_L) WATER CONTENT % (10 20 30)	GROUNDWATER OBSERVATIONS AND REMARKS
	GROUND ELEVATION 256.64								
0	0.13 TOPSOIL : Black silty sand		256						Upon completion of augering, no free water, no cave.
	BEDROCK : Biotite Migmatite			1	RC		RUN (mm) 1524 / RECOVERY (%) 98 / ROD (%) 94 / DRILL WATER RETURN (%) 100		
1.5			255						
				2	RC		RUN (mm) 1524 / RECOVERY (%) 98 / ROD (%) 98 / DRILL WATER RETURN (%) 100		
3.0	3.18		254						
	BOREHOLE TERMINATED AT 3.18m		253						
4.5									
6.0									
7.5									
9.0									
10.5									
12.0									
13.5									
15.0									
16.5									

NOTES:

CHECKED BY:

PetoMacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 382–9

N 5 012 175
E 278 838

PROJECT W.P. 407–97–01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Airport Road Underpass, Site 44–382
LOCATION Station 10+054.2 (Airport Road) 15.0m Lt.
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE March 5, 1998
OUR PROJECT 97TF088A
ENGINEER A. D. Vanin
TECHNICIAN B. Garlick

SOIL PROFILE				SAMPLES			SHEAR STRENGTH C_u ▲ / DYNAMIC CONE PENETRATION × / STANDARD PENETRATION TEST ● BLOWS/0.3M (20 40 60 80)	LIQUID LIMIT W_L / PLASTIC LIMIT W_P / WATER CONTENT W (W_P — W — W_L) WATER CONTENT % (10 20 30)	GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES			
	GROUND ELEVATION 258.17								
0	BEDROCK		256						Upon completion of augering, no free water, no cave.
1.5									
3.0									
4.5									
6.0									
7.5									
9.0									
10.5									
12.0									
13.5									
15.0									
16.5									

NOTES:

CHECKED BY:

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 382–10

N 5 012 158
E 278 846

PROJECT W.P. 407–97–01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Airport Road Underpass, Site 44–382
LOCATION Station 10+053.5 (Airport Road) 3.0m Rt.
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE March 5, 1998

OUR PROJECT 97TF088A
ENGINEER A. D. Vanin
TECHNICIAN B. Garlick

SOIL PROFILE				SAMPLES			SHEAR STRENGTH C_u ▲ / DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ● BLOWS/0.3M (20 40 60 80)	LIQUID LIMIT W_L / PLASTIC LIMIT W_P / WATER CONTENT W (W_P W W_L) WATER CONTENT % (10 20 30)	GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES			
0	GROUND ELEVATION 257.23								
0.13	TOPSOIL : Black silty sand		257						Upon completion of augering, no free water, no cave.
	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 0.13m. PROBABLE BEDROCK.								
1.5									
3.0									
4.5									
6.0									
7.5									
9.0									
10.5									
12.0									
13.5									
15.0									
16.5									

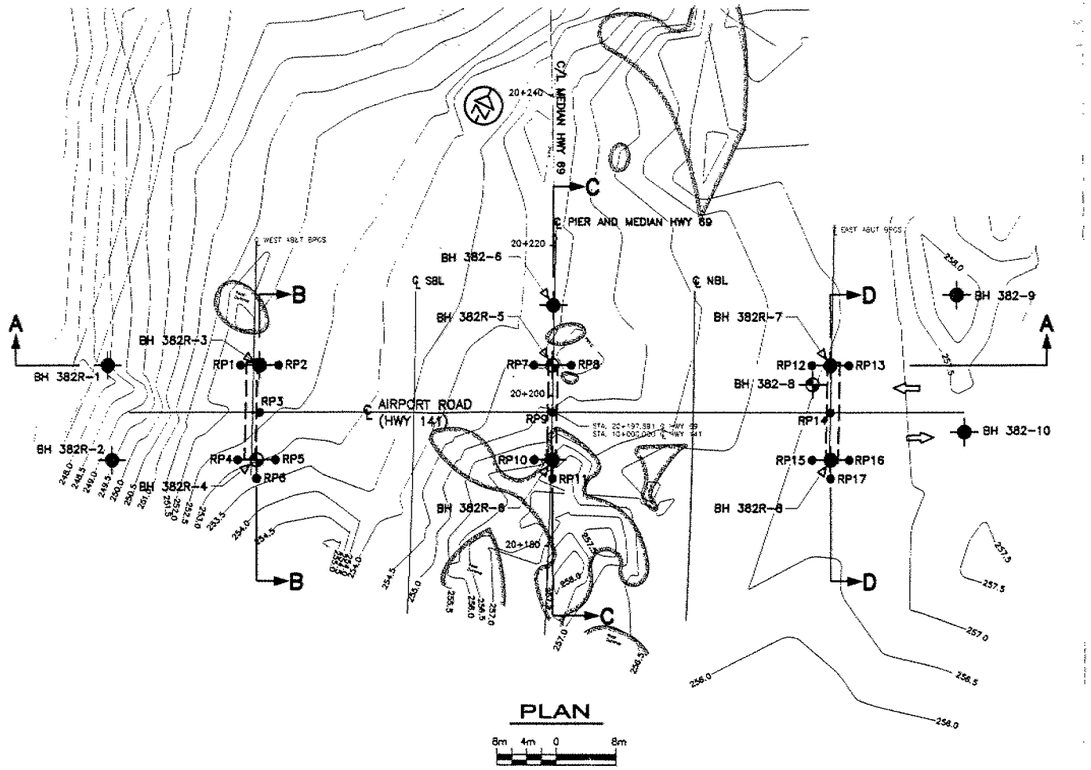
NOTES:

CHECKED BY: [signature]

PLATE No 4790-69/670

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN



SECTION B - B

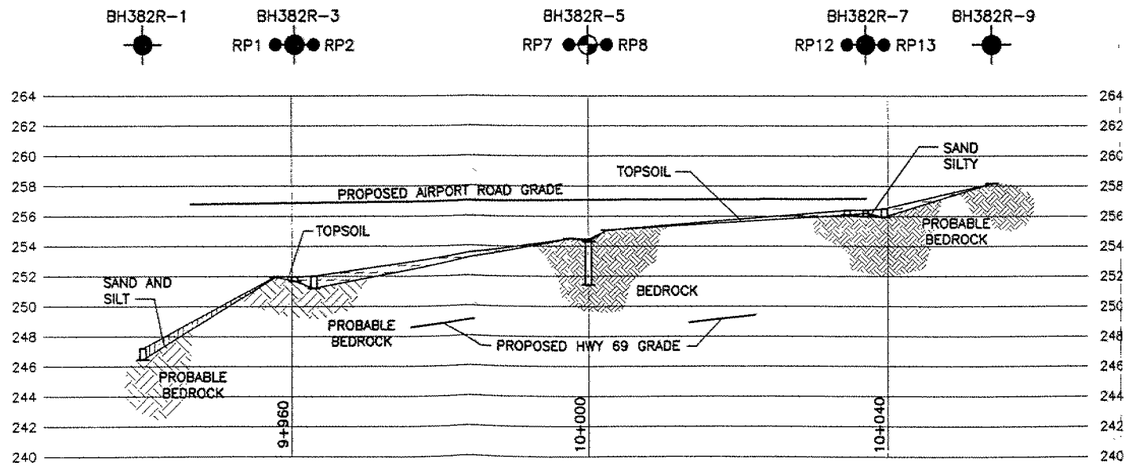
SECTION C - C

SECTION D - D

4m 2m 0 4m HOR.
2m 1m 0 2m VERT.

PLAN

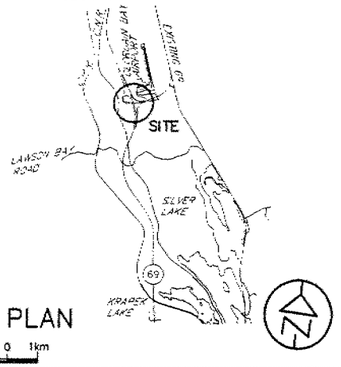
8m 4m 0 8m



SECTION A - A

8m 4m 0 8m HOR.
4m 2m 0 2m VERT.

DISTRICT MUNICIPALITY OF PARRY SOUND
GEOG TWP HUMPHREY



KEY PLAN

0.5km 0 1km

BOREHOLE	NORTHING	EASTING	ELEVATION
382R-1	N 5 012 116	E 278 740	247.20
382R-2	N 5 012 105	E 278 746	247.00
382R-3	N 5 012 125	E 278 758	251.96
382R-4	N 5 012 114	E 278 763	252.41
382R-5	N 5 012 143	E 278 794	254.46
382R-6	N 5 012 131	E 278 799	256.47
382R-7	N 5 012 159	E 278 826	265.39
382R-8	N 5 012 148	E 278 832	256.54
382-6	N 5 012 150	E 278 790	254.49
382-8	N 5 012 155	E 278 826	256.64
382-9	N 5 012 175	E 278 838	258.17
382-10	N 5 012 158	E 278 846	257.23

LEGEND

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

NOTE

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

PROPOSED CROSSING
AT
AIRPORT ROAD UNDERPASS
AND
PROPOSED KING'S HIGHWAY 69
DISTRICT MUNICIPALITY OF MUSCOKA

LOT 15 GEOG TWP FREEMAN
CON 2 TWP OF GEORGIAN BAY

SCALE	DISTRICT	REGION
AS SHOWN	52 HUNTSVILLE	NORTHERN
WP/WO 407-97-01	PLAN B-790-69-008	
SURVEY 97 12	PLAN 97 12	
SITE 44-382	PLAN E-790-69-067	

Peto MacCallum Ltd.
CONSULTING ENGINEERS
45 BURFORD ROAD, HAMILTON, ONTARIO L8E 3C6

DRAWN	CB	DATE	SCALE	JOB NO.	DRAWING NO.
CHECKED	MRA	AUGUST 1999	AS SHOWN	97TF088H	1
APPROVED	DWK				

BOREHOLE LOCATION PLAN AND SOIL PROFILES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

FOUNDATION DESIGN REPORT
FOR
AIRPORT ROAD UNDERPASS
W.P. 407-97-01
G.W.P. 290-97-00, SITE 44-382
HIGHWAY 69, DISTRICT 52
HUNTSVILLE, ONTARIO

Distribution:

13 cc: McCormick Rankin Corporation for distribution to Ministry of Transportation
2 cc: McCormick Rankin Corporation
1 cc: PML Hamilton
1 cc: PML Toronto
1 cc: PML Barrie

Job No. 97TF088H
Geocres No. 31E-135

August, 1999

TABLE OF CONTENTS

Peto MacCallum Ltd.
CONSULTING ENGINEERS

FOUNDATION DESIGN REPORT

For
Airport Road Underpass
W.P. 407-97-01
G.W.P. 290-97-00, Site 44-382
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 Airport Road.

Construction of a two span underpass structure is planned. At the underpass location, the proposed four-lane Highway 69 will be constructed in a bedrock cut of some 4.0 to 7.0 m (road centreline grade near elevation 249.0). Road grades on Airport Road over the structure will be near elevation 256.8 to 257.1, some 4.5 m above existing grade at the west abutment and near existing grade at the east abutment (based on General Arrangement Drawing dated February 1999).

The subsurface stratigraphy revealed at the bridge site generally comprised a veneer of topsoil, sand, sand/silt and/or sand/gravel overlying bedrock contacted at depths of 0 to 900 mm.

FOUNDATIONS

Based on the borehole information, it is considered that the structure may be supported on conventional spread footings founded on bedrock. Foundations bearing on sound bedrock at or below elevations 251.5 to 257.1 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

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BARRIE, BRAMPTON, HAMILTON, KITCHENER, TORONTO

settlement since the loading required to produce deformation will be much larger than the factored capacity at ULS.

The bedrock cut for construction of Highway 69 at the structure location is expected to increase from about 4 m at the west abutment to 7 m at the east abutment. Current plans call for an approximate 10 m wide rock ridge along the centre median to be unexcavated.

The abutment footings should be founded below a line inclined upwards at 1:2 (H:V) from the toe of the Highway 69 cut. Footings for the centre pier may be constructed on the rock "ridge" along the median provided they are founded below a line inclined upwards at 1:1 from the toe of the excavation, the edge of footing is at least 1.0 m from the rock excavation face, and the rock pillar does not exceed 2 m in height.

The existing bedrock surface at the west abutment is expected to be relatively level. Excavation to the proposed founding level at the centre pier and east abutment should be carried out in a manner which provides a level founding surface. Mass concrete could be placed to level minor variations in the founding surface.

It is important that blasting/excavation of the rock along the northbound and southbound lanes of the highway in the vicinity of the pier is controlled to prevent disturbance to the rock. The excavation specifications should call for the contractor to retain a blasting specialist to establish blast criteria/ procedures to prevent disturbance. It should be stipulated that payment will be limited to excavation to the limits shown on the drawing, overblasting/excavation will be the responsibility of the contractor, and all loosened rock is to be removed.

Mechanical means should be employed to excavate the loosened rock at the pier footing. A large excavator equipped with a "tiger tooth" bucket in conjunction with a jackhammer or hoe ram is the preferred method of excavation to shallow depths in rock.

Alternatively, spread footings at the west abutment could be constructed on structural fill placed in the approach. 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 recommended bearing resistances for footings constructed on structural fill are as follows:

Assumed Footing Width (m)	Factored Bearing Resistance at ULS (kPa)	Bearing Resistance at SLS (kPa)
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 1.8 m was assumed for computation of the ULS capacities.

All footings subject to frost action should be provided with the normal 1.8 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 (kN/m^3)

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

For a Granular "A" or rock fill backslope inclined at 1.5 horizontal to 1 vertical, an active earth pressure coefficient of 0.53 is recommended. This value applies to a slope of infinite height; for a limited height backfill, it may be preferable to treat the material above the level of the top of the wall as a surcharge load (q in the preceding equation).

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.

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. A value of 0.7 may be used for a roughened bedrock surface (asperity height of at least 25 mm) created by mechanical means or during rock excavation.

The lateral resistance of footings founded on bedrock could be increased by installing anchors into the bedrock. The increased lateral resistance will be provided by the shear strength of the steel dowels, the horizontal component of tensile forces developed in any inclined anchors, and/or increased frictional resistance between the footing and rock if the anchors are prestressed to increase the vertical pressure.

A factored rock-grout bond stress of 1.4 MPa at the ultimate limit state (resistance factor of 0.4 applied, minimum 35 MPa grout) is recommended for design. The anchors should extend a minimum 30 bar diameters into sound bedrock and be spaced a distance of at least four times the diameter of the dowel. The impact of dowel interaction should be assessed if the spacing is less than one-fifth of the anchor length.

APPROACH FILL

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

The embankments should be constructed in accordance with OPSD 200.01, 200.02, 201.01, 201.02 and 202.010. The side slopes of approach fills should be inclined no steeper than 2:1 (H:V) for earth fill and 1.25:1 for rock fill. For high rock fill embankments, provide 2.0 m wide berms so that no uninterrupted rock slope is greater than 6 m high in accordance with the Northern Region Pavement Design Practices and Guidelines.

No settlement or bearing capacity problems due to placing fill on the bedrock or inorganic native overburden are anticipated. If footings are constructed on structural fill, the topsoil should be stripped prior to placement of the approach fill.

EXCAVATION AND GROUNDWATER CONTROL

Excavation for construction of footings, if employed, is expected to be carried out within the topsoil/sand and bedrock. Excavation of the overburden is expected to be relatively straightforward. The topsoil/sand would be classified as a Type 3 soil according to Occupational Health and Safety Act (Ontario Regulation 213/91) criteria.

Excavation of the rock will be more difficult requiring standard methods of rock excavation such as blasting and jack-hammering. The actual equipment required and method of excavation within the bedrock will be dependent upon the geometry of cut and relative depth of excavation into the bedrock.

The rock excavation should be carried out in a manner that minimizes fracturing of the bedrock surface on which the proposed foundations will bear.

Free water was not observed in the boreholes during the course of the fieldwork. Seepage or surface water which enters the excavation should be readily handled by conventional sump pumping techniques.

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, P.Eng., Project Engineer and reviewed by D.W. Kerr, P.Eng., Manager of Geotechnical and Geo-Environmental Services, Hamilton.

Yours very truly

Peto MacCallum Ltd.

REGISTERED PROFESSIONAL ENGINEER
D. W. KERR
PROVINCE OF ONTARIO

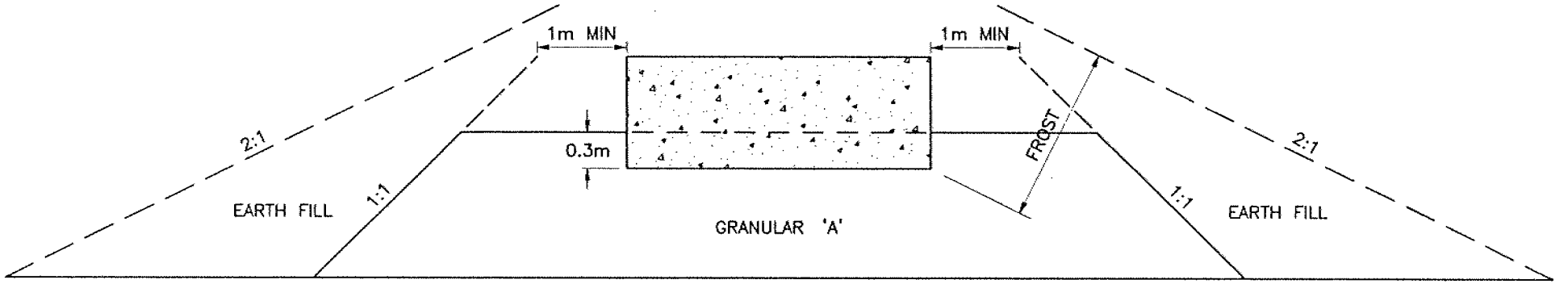
Dennis W. Kerr, M.Eng., P.Eng.
Manager Geotechnical and
Geo-Environmental Services

REGISTERED PROFESSIONAL ENGINEER
B. R. GRAY
PROVINCE OF ONTARIO

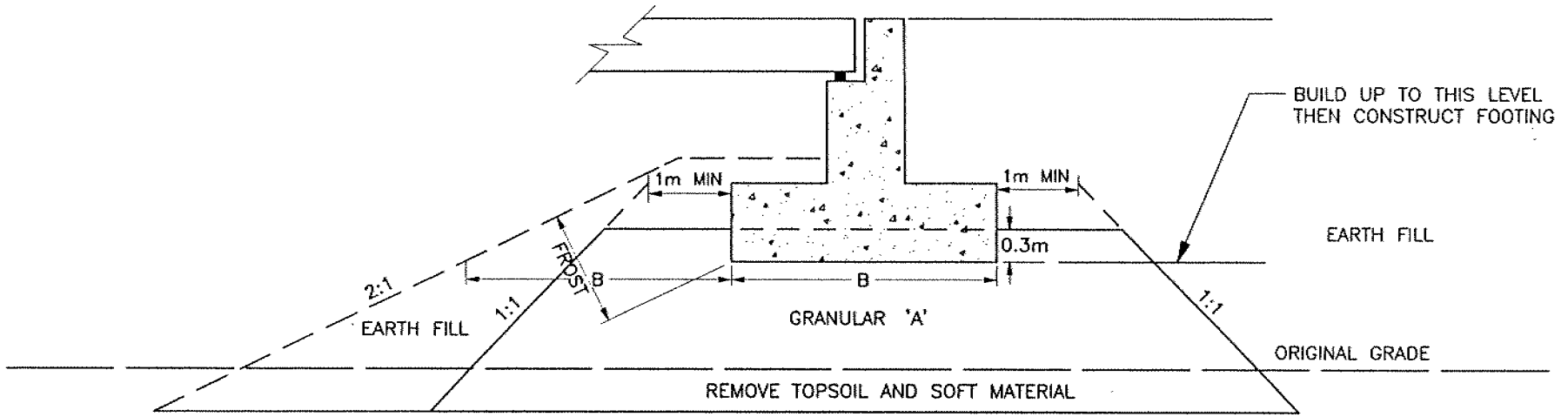
Brian R. Gray, M.Eng., P.Eng.
Vice-President
Geotechnical and
Geo-Environmental Services

MRA:mma

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

Ontario

memorandum

To: Mike Pearsall, P. Eng.
Senior Project Manager
Planning & Design Section
Northern Region

1999 10 20

From: Pavements and Foundation Section
Room 232, Central Building
Downsview, Ontario

Re: Final Foundation Investigation Reports
Hwy 69 - Four Laning From Tower Rd. Northerly 26.5 km to North of Hwy 141
Blackstone/Crane Lake Underpass, W.P. 408-97-01, Site 44-383
CNR Overhead, W.P. 405/406-97-01, Site 44-381 N&S
Healey Lake Road Underpass, W.P. 400-97-01, Site 44-377
Tower Road Underpass, W.P. 399-97-00, Site 44-321
Airport Road Underpass, W.P. 407-97-01, Site 44-382
G.W.P. 290-97-00, Hwy 69, District 52, Huntsville

We have conceptually reviewed the final Foundation reports for the above projects, dated August 1999 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.

Most of the comments made in the preliminary foundation report review are incorporated in the final report. However, following are our comments:

Healey Lake Road Underpass, Site 44-377; Section II, Page 8, Second Paragraph: The phrase "earth rock" should be changed to "earth fill".

Blackstone/Crane Lake Underpass, Site 44-383: It should be noted in the report that for excavation below water table, an NSSP for dewatering should be included in the contract.

CNR Overhead, Site 44-381 N&S: The following comments were made in our previous memo dated May 26, 1999, but not incorporated in the final report:

"at this location piles will be driven through the engineered fill. It should be specified in the Foundation report that the engineered fill will be constructed prior to pile driving. In order to drive the piles through the engineered fill, the fill should be constructed of granular material. It should also be specified that the particle size of the granular fill should not be larger than 75 mm for H-piles and 50 mm for pipe piles driving."

If you have any other questions, please advise.

K. Ahmad, P. Eng.
Foundation Engineer
For
T.C. Kim, P. Eng.
Senior Foundation Engineer

cc: T. Kazmierowski

file: c:\ken\2909700.mik.doc

Ontario

memorandum

To: Bruce Sedgwick, P. Eng.
Senior Project Engineer
Planning and Design Section
Northern Region

1999 05 26

From: Pavements and Foundations Section
Room 232, Central Building
Downsview, Ontario

Re: Draft Foundation Investigation Reports
Highway 69 - Four Laning
From Tower Road Northerly 26.5 km to 2 km North of Hwy 141
Blackstone/Crane Lake Underpass, W.P. 408-97-01, Site 44-383
CNR Overhead, W.P. 405/406-97-01, Site 44-381 N&S
Healey Lake Road Underpass, W.P. 400-97-01, Site 44-377
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Airport Road Underpass, W.P. 407-97-01, Site 44-382
G.W.P. 290-97-00, 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 projects

1. MTO has established the frost depth for the Huntsville District as 1.8m. The frost depth in all the Foundation reports for this project should be specified as1.8 m.

2. Recommendation should be given for the side slopes of the approach fills.

3. The Key Plan, northing and easting and the stations shown on the plan are very small. After the drawings are reproduced to include in the contract package, they would not be legible.

4. The cross sections are very small (some of them are thumb size) and should be enlarged. These cross sections will be included in the contract package. When they are reproduced for the contract package, they would not be legible. The plan is produced in 1:500 scale. The cross sections are normally 100 percent larger than the plans to show the details. But in the report the cross sections are 50 percent reduced. Ideally the cross sections should be in true scale, i.e. same horizontal and vertical scales. If the true scale is not feasible, then the ratio of horizontal and vertical scales should be 2. The ratio of the horizontal and vertical scale in the foundation reports are 5. The cross sections, therefore, are very distorted. All the cross sections do not have to fit on one drawing. Cross sections can be produced on more than one drawings. A sample copy of the standard drawing can be obtained from the Pavements and Foundations office.

5. A bar scale, similar to the one provided on the plan should also be provided on the cross sections

6. The Pavements and Foundations Section has assigned Geocres Numbers for these projects. The Consultant should provide the Geocres numbers on the Final Reports. The Geocres number shall be shown on the lower left corner of the Title Page of the Foundation reports.

Blackstone/Crane Lake Road, Site 44-383

1 Page 2 (Section II): The recommended pile resistance on bedrock is conservative and should be revised. Due to the high grade steel of the H-Piles, The pile resistance on sound bedrock has been increased. For example the pile resistance at ULS for HP 310X110 piles is 2000 kN. The term "Pile Capacity" is not used any more in OHBDC. The Consultant should refer to the OHBDC 91, 3rd Edition.

2 The Geocres Number for this project is 31E-131.

CNR Overhead, Site 44-381, N&S

1 Page 2 (Section II): We understand that at this location piles will be driven through the engineered fill. It should be specified in the Foundation report that the engineered fill will be constructed prior to pile driving. In order to drive the piles through the engineered fill, the fill should be constructed of granular material. It should also be specified that the particle size of the granular fill should not be larger than 75 mm for H-piles and 50 mm for pipe piles.

2 Page 2 (Section II): The recommended pile resistance on bedrock is conservative and should be revised. Due to the high grade steel of the H-Piles, The pile resistance on sound bedrock has been increased. For example the pile resistance at ULS for HP 310X110 piles is 2000 kN. The term "Pile Capacity" is not used any more in OHBDC. The Consultant should refer to the OHBDC 91, 3rd Edition.

3 The Geocres Number for this project is 31E-132.

Healey Lake Rd. Underpass, Site 44-377

1 Page 1 (Section II): The proposed abutment and pier locations are underlain by peat. The report did recommend removing peat from these locations. It should also be mentioned in the report that the engineered fill should be constructed prior to pile driving. In order to drive the piles through the engineered fill, the fill should be constructed of granular material. It should be specified that the particle size of the granular fill should not be larger than 75 mm for H-piles and 50 mm for pipe piles.

2 Page 2 (Section II): The recommended pile resistance on bedrock is conservative and should be revised. Due to the high grade steel of the H-Piles, The pile resistance on sound bedrock has been increased. For example the pile resistance at ULS for HP 310X110 piles is 2000 kN. The term "Pile Capacity" is not used any more in OHBDC. The Consultant should refer to the OHBDC 91, 3rd Edition.

3 The Geocres Number for this project is 31E-133.

Tower Road Underpass, Site 44-321

1 The Geocres Number for this project is 31E-134.

Airport Road Underpass, Site 44-382

1 The Geocres Number for this project is 31E-135.

If you have any questions, please advise.

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For

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