

G.I.-30 SEPT. 1976

GEOCRES No. 31E-140DIST. 52 REGION W.P. No. 423-98-01
GWP: 291-97-00(B)CONT. No. W. O. No. STR. SITE No. 44-401HWY. No. 69LOCATION Black Road UnderpassNo. of PAGES -=====
OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:

**FOUNDATION INVESTIGATION REPORT
FOR
BLACK ROAD UNDERPASS
W.P. 423-98-01
G.W.P. 291-97-00, SITE 44-401
HIGHWAY 69, DISTRICT 52
HUNTSVILLE, ONTARIO**

Distribution:

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Job No. 98TF010A

April, 1999

TABLE OF CONTENTS

INTRODUCTION.....	1
SITE DESCRIPTION	1
INVESTIGATION PROCEDURES	2
SUMMARIZED SUBSURFACE CONDITIONS	2
Peat.....	3
Sand Fill	3
Sand/Gravel	3
Bedrock.....	4
Groundwater	5
CLOSURE.....	5

FOUNDATION INVESTIGATION REPORT

For

Black Road Underpass

W.P. 423-98-01

G.W.P. 291-97-00, Site 44-401

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 Black Road (Station 15+855 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, Black Road chainage.

SITE DESCRIPTION

The site is located about 15 km south of Parry Sound along the existing Highway 69 alignment. The proposed structure will connect realigned Black Road and Horseshoe Lake Road over the proposed widened Highway 69. At the underpass, Black Road will run approximately northeast-southwest (east-west for the purposes of this report).

The bridge location is presently a wooded/brush-covered area. The ground surface is gently undulating, rising towards the west. Bedrock outcrops are evident throughout the bridge site. A large outcrop is visible along the west side of Highway 69 at the south end of the proposed centre pier location.

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 rock 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.

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 during the period December 15 to 17, 1998 and comprised three boreholes and 18 rock probes put down at the locations shown on Drawing 1. The boreholes and rock probes were drilled to refusal on bedrock/inferred bedrock at depths of 0.0 to 5.0 m. The boreholes were extended an additional 3.6 to 6.7 m into the bedrock using NQ rock coring equipment.

The test holes were advanced using continuous flight solid and 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. 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 and classification. A grain size distribution analysis was conducted on one sample of overburden. 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 Drawings 2 and 3.

The stratigraphy revealed in the borehole drilled at the west abutment comprised peat overlying bedrock. At the centre pier and east abutment, the stratigraphy consisted of sand fill overlying sand/gravel mantling bedrock. The strata encountered are summarized below.

Peat

Fine fibrous peat was encountered surficially in borehole 1. The peat mantled bedrock at 1.1 m depth.

Sand Fill

Loose sand fill was encountered surficially in boreholes 2 and 3. The fill layer was 1.1 and 0.9 m thick in boreholes 2 and 3, respectively.

Sand/Gravel

Sand and gravel was encountered below the fill in borehole 2. Compact sand was encountered below the fill in borehole 3. The results of a grain size distribution analysis conducted on a sample of the sand are presented on Figure 1. The sand/gravel mantled bedrock in both boreholes.

Bedrock

Bedrock was exposed surficially at the locations of four rock probes. Bedrock or inferred bedrock was contacted below the overburden at depths of up to 5.0 m in the remaining testholes. In general, the bedrock surface falls some 8 to 11 m from the west to east abutment. The bedrock/inferred bedrock elevations were as follows:

Testhole Number	Station & Offset		Ground Elevation	Depth to Rock (m)	Inferred Rock Elevation
West Approach					
RP 1	9+945.5	5 m LT	253.65	0.00	253.65
RP 2	9+945.5	5 m RT	254.67	0.00	254.67
West Abutment					
RP 3	9+964.0	5 m LT	251.64	0.55	251.09
RP 4	9+967.0	5 m LT	251.93	0.42	251.51
RP 5	9+964.0	C/L	251.72	0.40	251.32
BH 1	9+967.0	C/L	251.83	1.12	250.71
RP 6	9+964.0	5 m RT	252.95	0.42	252.53
RP 7	9+967.0	5 m RT	252.97	0.00	252.97
Centre Pier					
RP 8	9+998.5	5 m LT	247.27	0.53	246.74
RP 9	10+001.5	5 m LT	246.90	1.68	245.22
RP 10	9+998.5	C/L	247.26	0.69	246.57
BH 2	10+001.5	C/L	246.86	2.82	244.04
RP 11	10+000.0	5 m RT	247.67	0.00	247.67
RP 12	10+001.5	5 m RT	247.24	1.98	245.26
East Abutment					
RP 13	10+036.0	5 m LT	246.81	3.81	243.00
BH 3	10+034.0	C/L	246.93	4.98	241.95
RP 14	10+036.0	C/L	246.97	4.34	242.63
RP 15	10+034.0	5 m RT	246.16	4.57	241.59
RP 16	10+036.0	5 m RT	246.65	3.89	242.76
East Approach					
RP 17	10+054.5	5 m LT	248.70	0.97	247.73
RP 18	10+054.5	5 m RT	248.90	1.22	247.68

A description of the rock cores recovered from the boreholes is provided on Table I. The bedrock consists of migmatite, amphibolite, pegmatite and granitic gneiss. Core recovery ranged from 74 to 100% and the RQD ranged from 39 to 100%, 0% in the upper 600 mm in borehole 1. The rock was fair to excellent quality.

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

<u>Borehole No.</u>	<u>Depth (m)</u>	<u>Unconfined Compressive Strength (MPa)</u>
1	2.4	32.3
1	4.3	75.0
2	3.2	53.4
2	5.2	50.3
3	7.4	49.0

Groundwater

Upon completion of augering, free water was observed in borehole 3 at 2.5 m depth (elevation 244.4). Free water was not observed in the remaining boreholes during or upon completion of drilling. 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 All-Terrain Drilling Limited.

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:mmma

Our Ref: 98TF010A

TABLE I

ROCK CORE DESCRIPTION
WP 423-98-01
GWP 291-97-00, Site No. 44-401

CORE RECOVERY					CORE DESCRIPTION	
BOREHOLE	CORE NO.	DEPTH (m)	RECOVERY (%)	RQD (%)	DEPTH (m)	DESCRIPTION
1	1	1.12 – 1.70	74	0	1.12 – 2.50	PEGMATITE , black and white to black and brown coarse crystalline with biotite and muscovite mica; low strength; slightly weathered; with near vertical parting, rough undulating, oxidized; very poor to fair quality.
	2	1.70 – 2.41	89	68	2.50 – 4.50	MIGMATITE , homogeneous to slightly banded black, fine to medium crystalline, biotite to hornblende rich with 150 mm pegmatite layer; medium strength; unweathered; close to moderate spaced dipping partings, rough to smooth undulating, oxidized; poor becoming excellent quality.
	3	2.41 – 3.30	94	40		
	4	3.30 – 4.34	95	95		
	5	4.34 – 4.65	100	83		
	6	4.65 – 4.83	100	60		
	7	4.83 – 6.35	100	98		
	8	6.35 – 7.87	98	97	4.50 – 7.87	AMPHIBOLITE , black, fine crystalline, hornblende; high strength; unweathered; close to moderate spaced flat to dipping partings, rough planar, black oxidation/alteration on partings; excellent quality.

RQD = Rock Quality Designation

Logged by J. Wright

Our Ref: 98TF010A

TABLE I Cont'd

ROCK CORE DESCRIPTION
WP 423-98-01
WP 291-97-00, Site No. 44-401

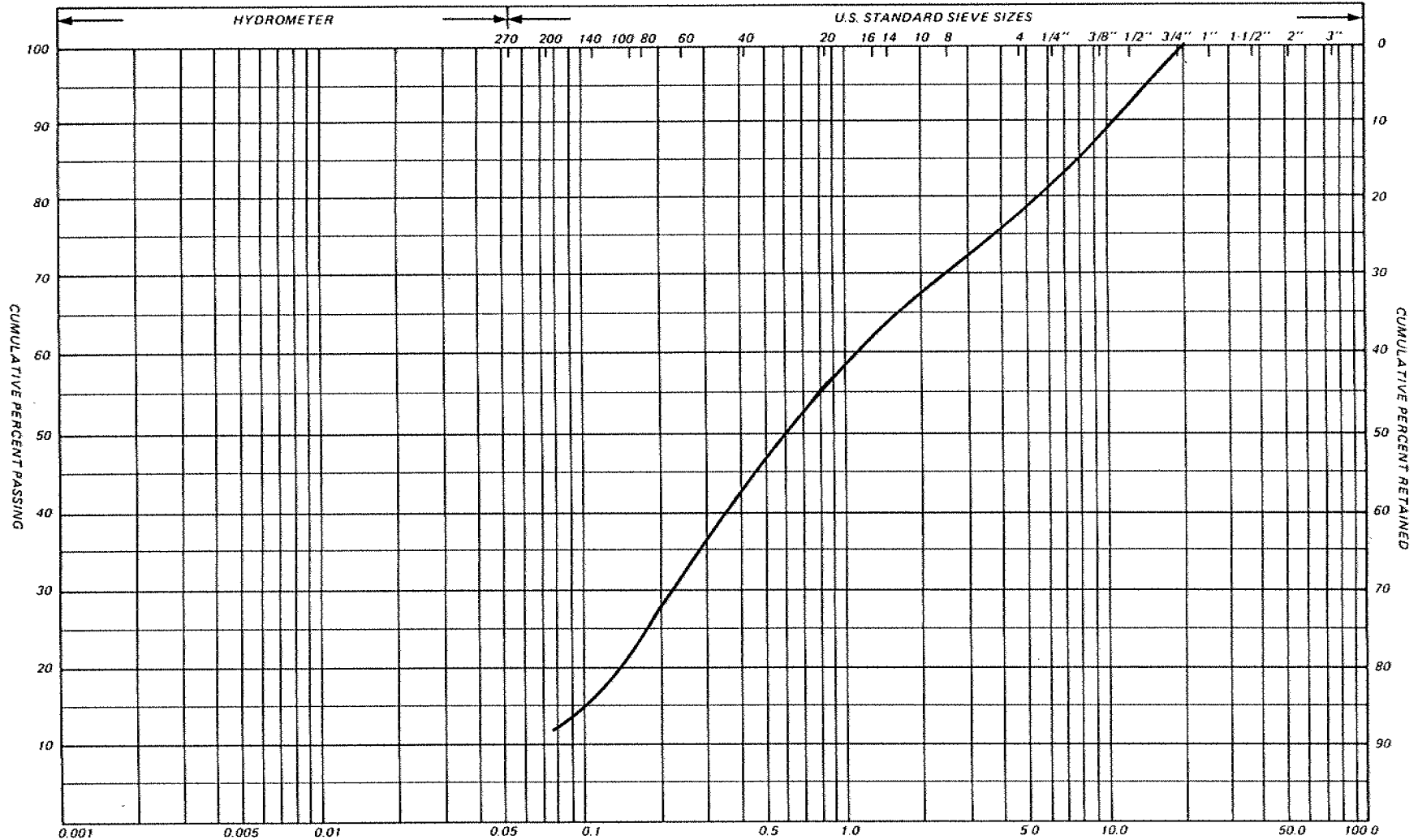
CORE RECOVERY					CORE DESCRIPTION	
BOREHOLE	CORE NO.	DEPTH (m)	RECOVERY (%)	RQD (%)	DEPTH (m)	DESCRIPTION
2	1	2.82 – 3.20	93	67	2.82 – 4.10	MIGMATITE , grey hornblende migmatite to banded gneiss, fine to medium crystalline with biotite concentrations; high strength; unweathered; close to moderate spaced flat to dipping partings, smooth undulating to rough planar, tight to oxidized; fair quality.
	2	3.20 – 4.06	100	71		
	3	4.06 – 5.66	97	90		
	4	5.66 – 5.97	100	75		AMPHIBOLITE , black to dark green, fine crystalline; high strength; unweathered; close spaced flat to dipping partings, rough planar, oxidized to tight; good to excellent quality. becoming green, serpentized; low to medium strength; slightly to moderately weathered; very close spaced partings, slickensided, undulating to rough planar, slightly altered; very poor to poor quality.
	5	5.97 – 6.10	90	0	4.10 – 6.10	
	6	6.10 – 6.60	94	39	6.10 – 6.60	
3	4	4.98 – 6.12	84	53	4.98 – 5.80	MIGMATITE , black hornblende migmatite, fine to medium crystalline; high strength; unweathered very close to close spaced, flat partings, rough planar, tight; fair quality
	5	6.12 – 7.39	100	100		
	6	7.39 – 8.61	100	100	5.80 – 8.61	GRANITIC GNEISS , pink granitic, fine to medium crystalline; high strength; unweathered; excellent quality

RQD = Rock Quality Designation

Logged by J. Wright

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 98TF010A
REPORT NO. -
FIGURE 1



SILT & CLAY				FINE SAND			MEDIUM SAND	COARSE SAND	GRAVEL	COBBLES	UNIFIED
CLAY	FINE SILT	MEDIUM SILT	COARSE SILT	FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL				M.I.T.
CLAY	SILT		V. FINE SAND	FINE SAND	MED. SAND	COARSE SAND	GRAVEL				U.S. BUREAU

REMARKS Borehole 3, Sample 3
Fine to coarse sand

LOG OF BOREHOLE NO. 1

N 5 018 128
E 274 254

PROJECT GWP 423-98-01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Black Road Underpass, Site 44-401
LOCATION Station 9+967.0 (Black Road) Centreline
BORING METHOD Continuous Flight Solid Stem Augers & NQ Rock Coring

BORING DATE December 15, 1998

OUR PROJECT 98TF010A
ENGINEER M. R. Anderson
TECHNICIAN M. Rapsey

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 %					
	GROUND ELEVATION	251.83					20	40	60	80	10	20	30			
0	PEAT : Brown fine fibrous peat		251											Upon completion of augering, no free water, no cave.		
1.12	BEDROCK : Pegmatite		250	1	RC		585	74	0	100						
1.5			250	2	RC		710	89	68	100						
2.50	Migmatite		249	3	RC		890	94	40	100						
3.0			248	4	RC		1040	95	95	100						
4.5	Amphibolite		247	5	RC		305	100	83	100						
			247	6	RC		180	100	60	100						
			246	7	RC		1525	100	98	100						
6.0			245	8	RC		1525	98	97	100						
7.5			244													
7.87	BOREHOLE TERMINATED AT 7.87m.		243				RUN (mm)	RECOVERY (%)	ROD (%)	DRILL WATER RETURN (%)						
9.0																
10.5																
12.0																
13.5																
15.0																
16.5																

NOTES:

CHECKED BY: *mt*

LOG OF BOREHOLE NO. 2

N 5 018 160
E 274 265

PROJECT GWP 423-98-01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE

SITE Black Road Underpass, Site 44-401

LOCATION Station 10+001.5 (Black Road) Centreline

BORING METHOD Continuous Flight Solid Stem Augers & NQ Rock Coring

BORING DATE December 15, 1998

OUR PROJECT 98TF010A

ENGINEER M. R. Anderson

TECHNICIAN M. Rapsey

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 %			
	GROUND ELEVATION	246.86					20	40	60	80	10	20	30	
0	SAND FILL : Loose, dark brown silty sand		246											Upon completion of augering, no free water, no cave.
1.10														
1.5	SAND AND GRAVEL : Brown sand and gravel, some silt, occasional cobbles and boulders		245											
2.82														
3.0	BEDROCK : Migmatite		244	1	RC		380	93	67	100				
4.10			243	2	RC		865	100	71	100				
4.5	Amphibolite													
			242	3	RC		1600	97	90	100				
6.0			241	4	RC		305	100	75	100				
				5	RC		125	90	0	100				
6.60				6	RC		510	94	39	100				
	BOREHOLE TERMINATED AT 6.60m.		240											
7.5							RUN (mm)	RECOVERY (%)	ROD (%)	DRILL WATER RETURN (%)				
9.0														
10.5														
12.0														
13.5														
15.0														
16.5														

NOTES:

CHECKED BY: *MMH*

LOG OF BOREHOLE NO. 3

N 5 018 192
E 274 269

PROJECT GWP 423-98-01, HIGHWAY 69, DISTRICT 52, HUNTSVILLE

SITE Black Road Underpass, Site 44-401

LOCATION Station 10+034.0 (Black Road) Centreline

BORING METHOD Continuous Flight Solid Stem Augers & NQ Rock Coring

BORING DATE December 16 & 17, 1998

OUR PROJECT 98TF010A

ENGINEER M. R. Anderson

TECHNICIAN M. Rapsey

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 246.93														
0.90	<u>SAND FILL</u> : Brown sand with gravel, trace of silt		246												
1.5	<u>SAND</u> : Compact, brown sand, trace of silt and gravel, damp		245	1	SS	17	•								
3.0	becoming saturated		244	2	SS	50/0mm*								* Bouncing on cobble	
4.5			243												
4.98			242	3	SS	27	•								
5.80	<u>BEDROCK</u> : Migmatite		241	4	RC		1145	84	53	100				Upon completion of augering, free water at 2.50m., no cave.	
6.0	Granitic Gneiss		240	5	RC		1270	100	100	100					
7.5			239	6	RC		1220	100	100	100					
8.61	BOREHOLE TERMINATED AT 8.61m.		238				RUN (mm)	RECOVERY (%)	RQD (%)	DRILL WATER RETURN (%)					
9.0															
10.5															
12.0															
13.5															
15.0															
16.5															

NOTES:

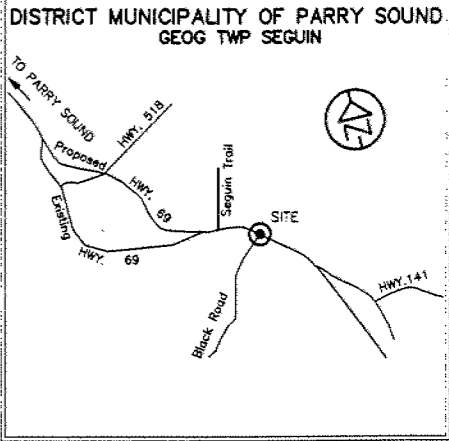
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BOREHOLE	NORTHING	EASTING	ELEVATION
BH 1	N 5 018 128	E 274 254	251.83
BH 2	N 5 018 160	E 274 265	246.86
BH 3	N 5 018 192	E 274 269	246.93

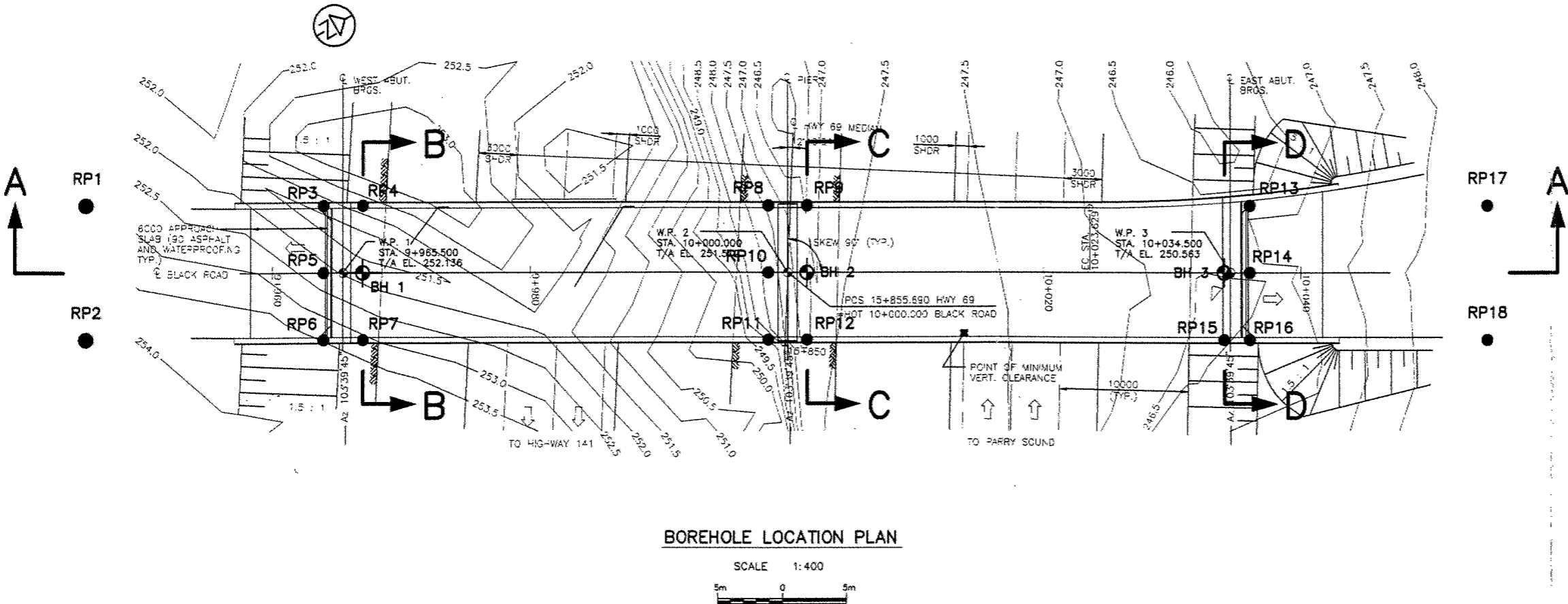
ROCK PROBE	ELEVATION
RP 1	253.65
RP 2	254.67
RP 3	251.64
RP 4	251.93
RP 5	251.72
RP 6	252.95
RP 7	252.97
RP 8	247.27
RP 9	246.90

ROCK PROBE	ELEVATION
RP 10	247.26
RP 11	247.67
RP 12	247.24
RP 13	246.81
RP 14	246.97
RP 15	246.16
RP 16	246.65
RP 17	248.70
RP 18	248.90

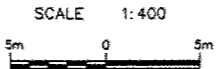
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AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



KEY PLAN
N.T.S.

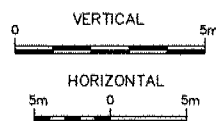
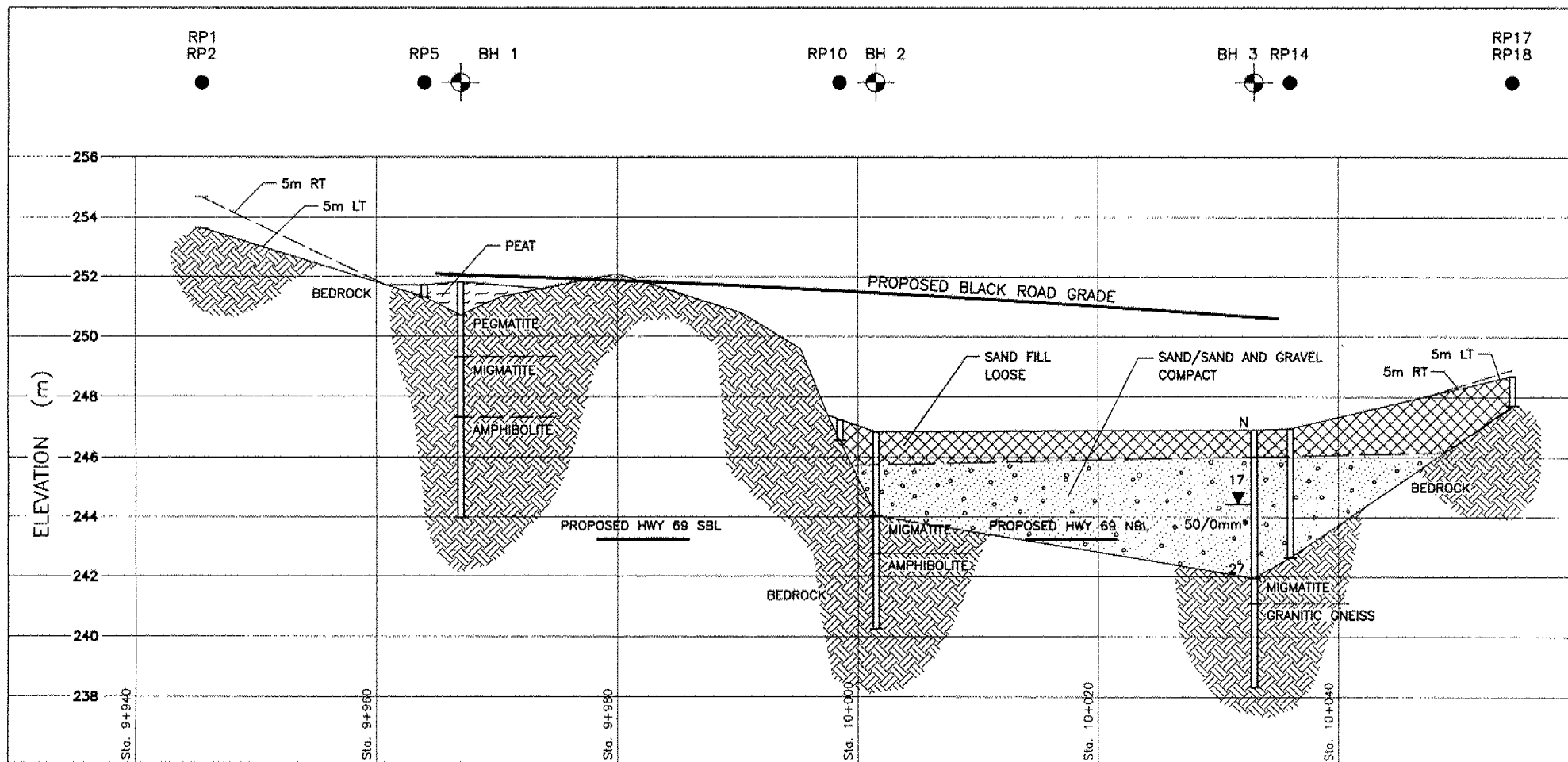


BOREHOLE LOCATION PLAN



LEGEND				
●	ROCK PROBE	⊕	BOREHOLE & ROCK CORE	
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.				
3. REFER TO DRAWINGS 2 & 3 FOR SOIL PROFILES AND CROSS SECTIONS.				
MINISTRY OF TRANSPORTATION ENGINEERING AND RIGHT OF WAY OFFICE SURVEYS AND PLANS SECTION				
PROPOSED CROSSING AT BLACK ROAD AND KING'S HIGHWAY 69 DISTRICT MUNICIPALITY OF PARRY SOUND				
LOT 121 GEOG TWP FOLEY		CON B TWP OF SEGUIN		
SCALE AS SHOWN	DISTRICT 52 HUNTSVILLE	REGION NORTHERN		
WP/WO 423-98-01				
SURVEY				
SITE 44-401				
Peto MacCallum Ltd. CONSULTING ENGINEERS 45 BURFORD ROAD, HAMILTON, ONTARIO L8E 3C8				
DRAWN CB	DATE	SCALE	JOB NO.	DRAWING NO.
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BOREHOLE LOCATION PLAN



SECTION A-A

LEGEND

- ROCK PROBE
- ⊕ BOREHOLE
- ▼ OBSERVED WATER LEVEL
(DURING OR UPON COMPLETION OF DRILLING)

NOTES

1. REFER TO DRAWING NO. 1 FOR BOREHOLE AND SECTION LOCATIONS.
2. REFER TO LOG OF BOREHOLE SHEETS FOR DETAILED SUBSURFACE CONDITIONS.
3. THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES, BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE.

WP 423-98-01 SITE 44-401

PROPOSED CROSSING AT
AT
BLACK ROAD
AND
KING'S HIGHWAY 69
DISTRICT MUNICIPALITY OF PARRY SOUND

LOT 121
GEOG TWP FOLEY

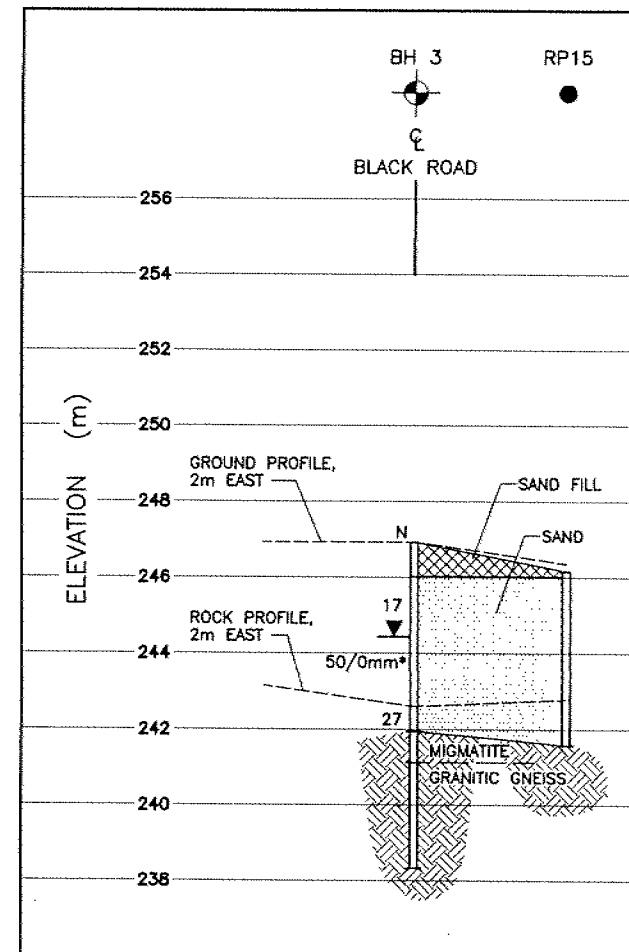
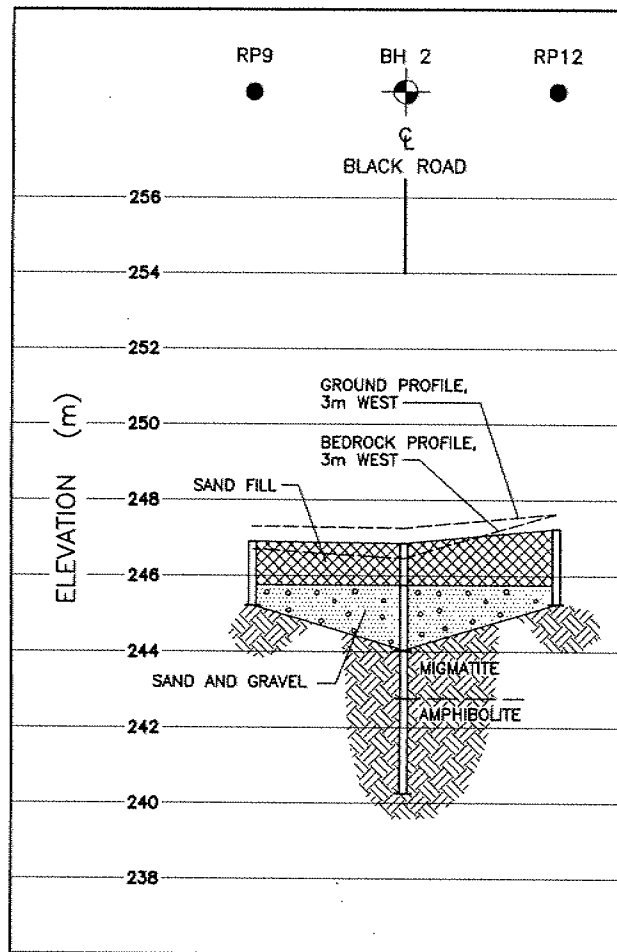
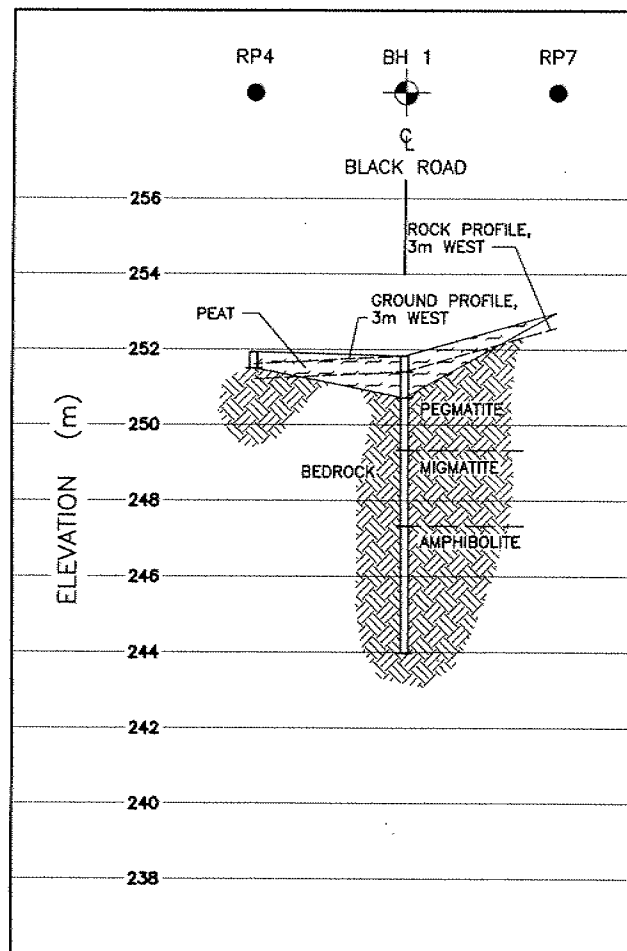
CON B
TWP OF SEGUIN

SOIL PROFILES

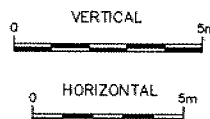
Peto MacCallum Ltd.
CONSULTING ENGINEERS

45 BURFORD ROAD, HAMILTON, ONTARIO L8E 3C8
Tel: (905) 561-2231 Fax: (905) 561-6363

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SECTION B-B



SECTION C-C

SECTION D-D

LEGEND

- ROCK PROBE
- ⊕ BOREHOLE
- ▽ OBSERVED WATER LEVEL (DURING OR UPON COMPLETION OF DRILLING)

NOTES

1. REFER TO DRAWING NO. 1 FOR BOREHOLE AND SECTION LOCATIONS.
2. REFER TO LOG OF BOREHOLE SHEETS FOR DETAILED SUBSURFACE CONDITIONS.
3. THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES, BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE.

WP 423-98-01 SITE 44-401		SOIL PROFILES	
PROPOSED CROSSING AT AT BLACK ROAD AND KING'S HIGHWAY 69 DISTRICT MUNICIPALITY OF PARRY SOUND		Peto MacCallum Ltd. CONSULTING ENGINEERS <small>45 BURNFORD ROAD, HAYTUN, ONTARIO, L8E 3C8 TEL: (905) 261-2231 FAX: (905) 261-6363</small>	
DATE	SCALE	JOB NO.	DRAWING NO.
APRIL 1999	VERTICAL 1:200 HORIZONTAL 1:250	98TF010A	3

LOT 121
GEOG TWP FOLEY

CON B
TWP OF SEGUIN

**FOUNDATION DESIGN REPORT
FOR
BLACK ROAD UNDERPASS
W.P. 423-98-01
G.W.P. 291-97-00, SITE 44-401
HIGHWAY 69, DISTRICT 52
HUNTSVILLE, ONTARIO**

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Job No. 98TF010A

April, 1999

TABLE OF CONTENTS

INTRODUCTION.....	1
FOUNDATIONS.....	1
ABUTMENT WALLS.....	4
APPROACH FILL.....	5
EXCAVATION AND GROUNDWATER CONTROL.....	6
CLOSURE.....	7

FOUNDATION DESIGN REPORT

For
Black Road Underpass
W.P. 423-98-01
G.W.P. 291-97-00, Site 44-401
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 Black Road.

Construction of a two span underpass structure is planned. Based on the General Arrangement Drawing dated February 1999, the proposed four-lane Highway 69 will be constructed in a cut of some 4.0 to 9.0 m (road grade at elevation 243.5 SBL and 243.3 NBL). Road grades on Black Road over the structure will be range from elevation 250.6 (east abutment) to 252.1 (west abutment).

The subsurface stratigraphy revealed at the bridge site comprised a veneer of peat over bedrock at the west abutment, and sand fill over sand/gravel mantling bedrock at the centre pier and east abutment.

FOUNDATIONS

The site is not considered suitable for construction of an integral abutment bridge supported on steel H-piles due to the shallow depth to bedrock.

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 the following elevations may be designed using a factored bearing resistance of 10,000 kPa at the ultimate limit state:

<u>Foundation Unit</u>	<u>Elevation</u>
West Abutment	
North End	251.1
Centre	250.7
South End	252.5
Centre Pier	
North End	245.2
Centre	244.0
South End	245.2
East Abutment	
North End	243.0
Centre	241.9
South End	241.6

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 sloping bedrock surface at the east abutment and centre pier should be should be benched or socketed to provide a level founding surface for the footings. Placement of mass concrete with dowels installed into the underlying bedrock should be adequate to provide a level founding surface at the west abutment. All loose or disturbed rock should be removed from the founding surfaces.

The abutment footings on rock should be founded below a line inclined upwards at 1 : 2 (H : V) from the toe of the highway cut. Footings for the centre pier may be constructed on the rock "ridge" along the centre median provided they are founded below a line inclined upwards at 1 : 1 from the toe of the excavation and the edge of footing is at least 2.0 m from the rock excavation face.

It is important that blasting and excavation along the highway in the vicinity of the structure be 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.

Spread footings at the east abutment could be constructed on structural fill placed in the approach. The structural 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 bearing resistances for a minimum 2.5 m wide footing constructed on structural fill are as follows:

Factored Bearing Resistance at ULS	= 1000 kPa
Bearing Resistance at SLS	= 300 kPa

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.

The existing sand fill should be stripped prior to placement of the structural fill. The structural fill should be at least 1.5 m thick if constructed over the sand overburden.

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 (kN/m³)

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.

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 during rock excavation or by mechanical means.

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 anchor. The total capacity of a group of closely spaced anchors may be less than the summed capacities of the individual anchors; 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. 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. The peat, existing loose sand fill, and any other deleterious/organic material should be stripped prior to placement of the approach fill.

EXCAVATION AND GROUNDWATER CONTROL

Excavation of the peat, fill and sand/gravel for foundation construction is expected to be relatively straightforward. The overburden is classified as a Type 3 soil according to Occupational Health and Safety Act (Ontario Regulation 213/91) criteria. Sidewalls in temporary excavations exceeding 1.2 m depth should be inclined at 1 horizontal to 1 vertical.

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 observed at 2.5 m depth (elevation 244.4) in borehole 3 drilled at the east abutment. This water appears to be confined to the east and west by the rising bedrock surface; the north-south limit of the water bearing sand was not defined. Measures to control/remove the groundwater (such as pumping from closely spaced sumps) will be required to permit excavation of the sand below the water level. Otherwise, seepage or surface water that enters the excavations 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.

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

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

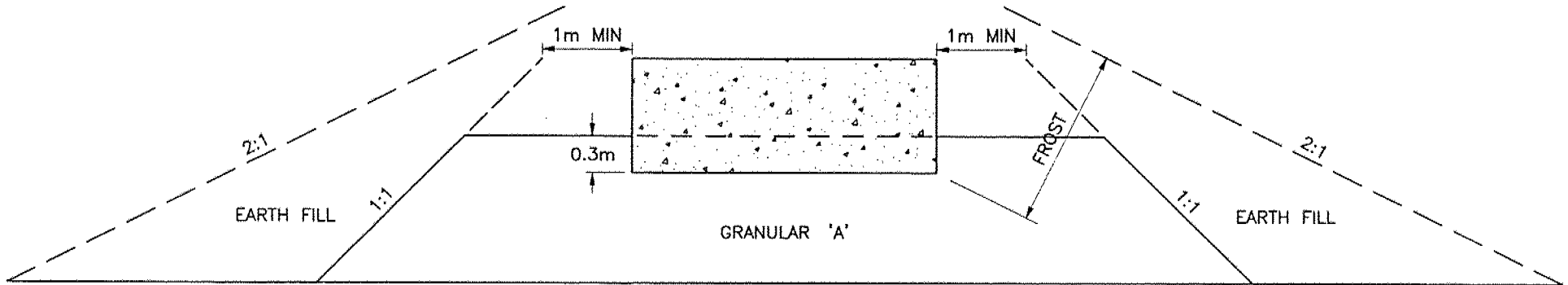


A handwritten signature in black ink, appearing to read "Brian R. Gray", written over a horizontal line.

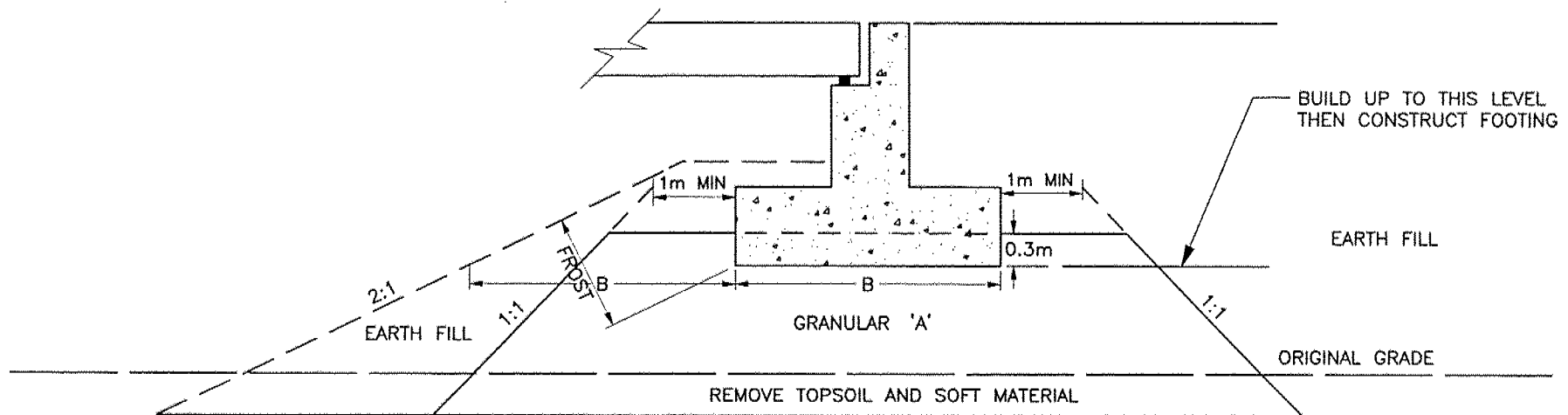
Brian R. Gray, M.Eng., P.Eng.
Vice-President
Geotechnical and
Geo-Environmental Services

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

NOTE : THE FOLLOWING ADDITIONAL INFORMATION WILL BE PROVIDED IN THE FINAL REPORT

1. FOOTING LOCATIONS
2. PROFILE AND CROSS SECTIONS ON DRAWING NO. 2.
3. KEY PLAN
4. SITE NUMBER, PROFILE, PLAN AND SURVEY INFORMATION.



TEST PIT	ELEVATION
1	247.68
2	247.07
3	247.19

ROCKPROBE	ELEVATION	ROCKPROBE	ELEVATION
1	247.68	11	247.23
2	247.58	12	246.56
3	247.72	13	246.59
4	247.76	14	247.17
5	247.88	15	246.94
6	247.93	16	244.81
7	247.91	17	244.54
8	248.66	18	244.54
9	248.09	19	244.54
10	246.76		

METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

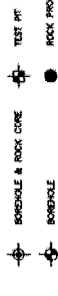
DISTRICT MUNICIPALITY OF PARRY SOUND
GEOG TWP FOLEY

KEY PLAN

0.5m 0 1 km

BOREHOLE	LOCATION	ELEVATION
1	N5 017 910 E 273 780	247.30
2	N5 017 880 E 273 900	247.30
3	N5 018 096 E 274 351	247.65
4	N5 018 092 E 274 366	248.05
5	N5 018 350 E 274 260	247.12
6	N5 018 300 E 274 410	247.05
7	N5 018 153 E 274 426	248.57
8	N5 018 149 E 274 443	244.55
9	N5 018 750 E 274 840	244.65
10	N5 018 700 E 275 020	245.20

LEGEND



NOTE

1. REFER TO LOG OF BOREHOLE SHEETS FOR DETAILED SURFACE CONDITIONS.
2. THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES, THE BOUNDARIES ARE ASSUMED FROM GEOTECHNICAL EVIDENCE.
3. REFER TO DRAWING 2 FOR SOIL PROFILES AND CORES SECTION.

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

PROPOSED CROSSING

AT

BLACK ROAD

AND

PROPOSED KING'S HIGHWAY 69

LOT 121 DISTRICT MUNICIPALITY OF PARRY SOUND
GEOG TWP FOLEY

CON B
TWP OF SEQUIN

SCALE	DISTRICT	REGION
AS SHOWN	52 HUNTSVILLE	NORTHERN
WP / NO	PROFILE	PLAN
291-97-00		

SURVEY

PLAN

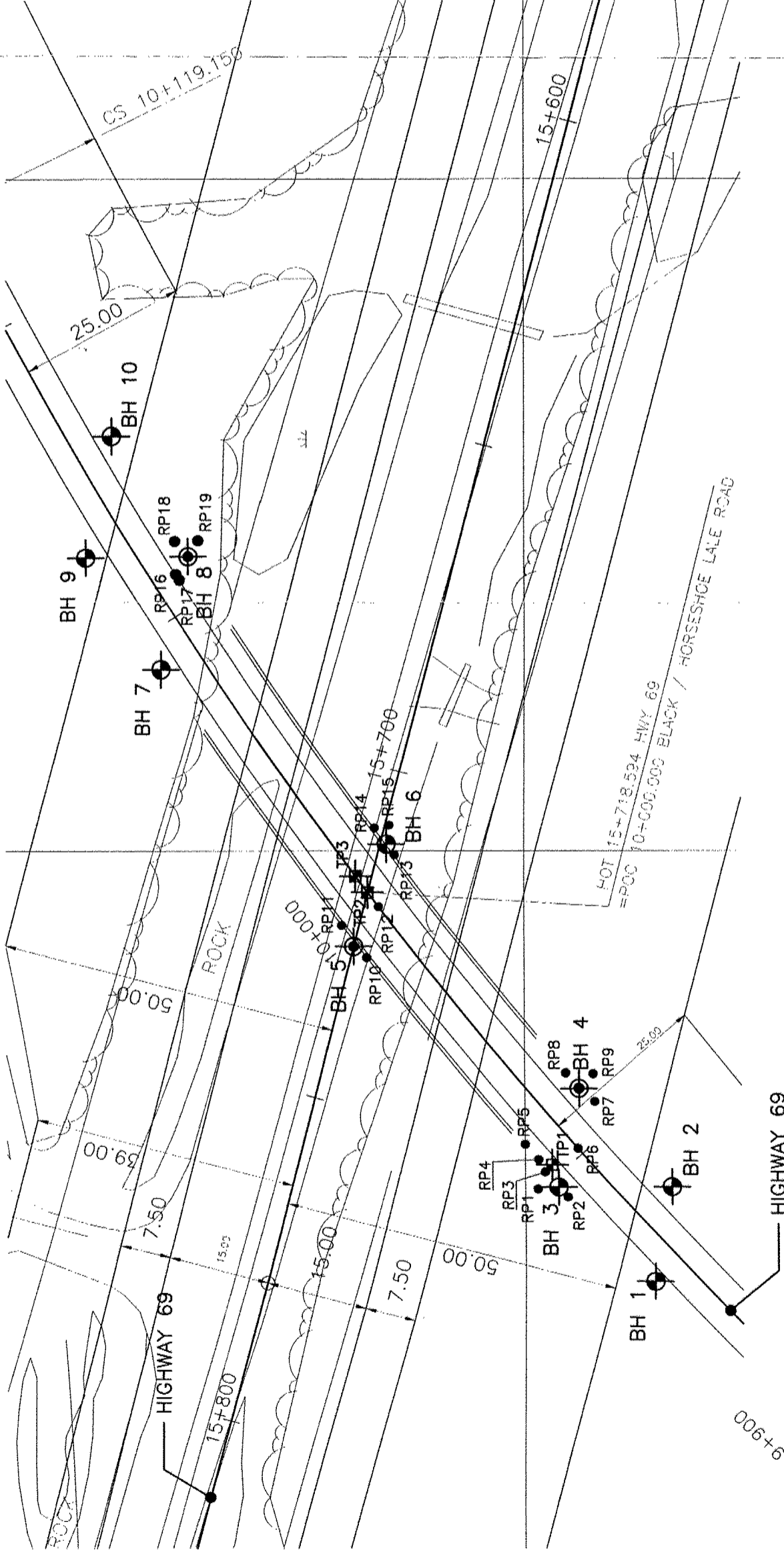
SITE 44-000

Peto MacCallum Ltd.

CONSULTING ENGINEERS
45 RUTLAND ROAD, HAMILTON, ONTARIO L8N 2R9

DRAWN	CB	DATE	SCALE	JOB NO.	DRAWING NO.
CHECKED	EW	OCT. 1998	AS SHOWN	98TF010	1
APPROVED	DWK				

BOREHOLE LOCATION PLAN



BOREHOLE LOCATION PLAN

SCALE 1:750

LOG OF BOREHOLE NO. 1

PROJECT G. W. P. 291-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Black Road Underpass, Site
LOCATION Station 9+929 (Black Road) 5.0 m Lt. Centreline Median
BORING METHOD Continuous Flight Hollow Stem Augers

OUR PROJECT 98TF010
BORING DATE August 31, 1998
ENGINEER E. Wong
TECHNICIAN M. Rapsey

SOIL PROFILE			SAMPLES			SHEAR STRENGTH C_u	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P — W — W_L WATER CONTENT %	GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE			
	GROUND ELEVATION 247.30							
0								
0.30	TOPSOIL : Dark brown, silty sand, high organic		247					Upon completion of augering, free water at 0.60m.
				1	SS	18		
1.50	SAND : Compact, brown, fine to coarse sand, some gravel, trace of silt, wet		246					
	becoming grey, silty sand, saturated			2	SS	34		
2.30			245					
	CLAY : Very soft, brown clay, high plastic, W.T.P.L.			3	SS	1		
3.0								
3.10			244					
	SAND : Compact, grey, fine to coarse sand, some gravel, saturated			4	SS	21		
4.5			243					
5.03				5	SS	25		
	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 5.03m. BEDROCK ASSUMED.		242					
6.0								
7.5								
9.0								
10.5								
12.0								
13.5								
15.0								
16.5								

NOTE :
Site number as well as the Northing and Easting will be included with the final report.

NOTES:

CHECKED BY:

LOG OF BOREHOLE NO. 2

PROJECT G. W. P. 291-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Black Road Underpass, Site
LOCATION Station 9+937 (Black Road) 6.5 m Rt. Centreline Median
BORING METHOD Continuous Flight Hollow Stem Augers

OUR PROJECT 98TF010
ENGINEER E. Wong
TECHNICIAN M. Rapsey

SOIL PROFILE			SAMPLES		SHEAR STRENGTH c_u	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P — W — W_L WATER CONTENT %	GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER TYPE			
0	GROUND ELEVATION 247.30						
0.60	TOPSOIL : Dark brown, silty sand, high organic		247				Upon completion of augering, free water at 0.60m.
	SAND : Loose, grey, fine to coarse sand, some silt, saturated		246	1 SS	9		
1.5				2 SS	10		
			245	3 SS	10		
3.0				4 SS	3		
3.20	SILT : Very loose, grey silt, saturated		244				
3.80	CLAY : Very soft, grey clay, W.T.P.L.			5 SS	1		
4.5			243				
5.35			242	7 SS	8		
6.0	SAND : Loose, grey, silty sand, saturated						
	encountered boulder at 6.25m		241	8 SS	4/75mm		
7.5			240				
8.18	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 8.18m. BEDROCK ASSUMED.		239				
9.0							
10.5							
12.0							
13.5							
15.0							
16.5							

NOTES:

CHECKED BY:

LOG OF BOREHOLE NO. 3

PROJECT G. W. P. 291-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Black Road Underpass, Site
LOCATION Station 9+949 (Black Road) 6.0 m Rt. Centreline Median
BORING METHOD Continuous Flight Hollow Stem Augers

OUR PROJECT 98TF010
BORING DATE August 27, 1998 ENGINEER E. Wong
TECHNICIAN M. Rapsey

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 • BLOWS/0.3M	PLASTIC LIMIT W_P	WATER CONTENT W					
											WATER CONTENT %	W_P	W	W_L
	GROUND ELEVATION 247.65													
-0.75	PEAT : Dark brown, fine, fibrous peat		247	1	SS	6				Upon completion of augering, free water at 1.80m, cave at 1.85m.				
1.50	SAND : Loose, grey, fine sand, some silt, damp		246	2	SS	1								
2.30	CLAY : Very soft, brown, clay with silt seams, high plastic, W.T.P.L.		245	3	SS	34								
	SAND : Dense to compact, grey, fine to coarse sand, some silt, some gravel, saturated		244	4	SS	28								
			243											
4.72	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 4.72m. BEDROCK ASSUMED.		242											
NOTE : Site number as well as the Northing and Easting will be included with the final report.														

NOTES:

CHECKED BY:

LOG OF BOREHOLE NO. 4

PROJECT G. W. P. 291-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE

OUR PROJECT 98TF010

SITE Black Road Underpass, Site

LOCATION Station 9+957 (Black Road) 6.0 m Rt. Centreline Median

BORING DATE August 27, 1998

ENGINEER

E. Wong

BORING METHOD Continuous Flight Hollow Stem Augers

TECHNICIAN

M. Rapsey

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 * STANDARD PENETRATION TEST *				WATER CONTENT %			
							BLOWS/0.3M				WATER CONTENT %			
							20	40	60	80	W_p	W	W_L	
0.10	GROUND ELEVATION 248.05													
	ROOT MAT : Dark brown, fibrous root mat, organic			1	SS	34								
1.20	SAND : Dense, brown, fine sand, moist		247	2	RC		480	100	42	100				
	BEDROCK :		246	3	RC		280	100	73	100				
	Description to be provided in final report.			4	RC		1070	100	66	100				
			245											
				5	RC		1450	100	100	100				
4.50	BOREHOLE TERMINATED AT 4.50m.		244											
			243				RUN (mm)	RECOVERY (%)	RQD (%)	DRILL WATER RETURN (%)				
	</													

NOTE :

Site number as well as the
Northing and Easting will be
included with the final report.

NOTES:

CHECKED BY:

LOG OF BOREHOLE NO. 5

PROJECT G. W. P. 291-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Black Road Underpass, Site
LOCATION Station 9+995 (Black Road) 6.5 m Lt. Centreline Median
BORING METHOD Continuous Flight Hollow Stem Augers & NQ Rock Coring

OUR PROJECT 98TF010
ENGINEER E. Wong
TECHNICIAN M. Rapsey

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				WATER CONTENT %				
							BLOWS/0.3M				W_p W W_L				
							20 40 60 80				10 20 30				
0	GROUND ELEVATION 247.12														
	<u>SAND FILL</u> : Brown, silty sand												Upon completion of augering, free water at 1.80m, cave at 1.85m.		
0.90	-----		246	1	AS										
1.35	boulders														
1.5			245												
	<u>SAND</u> : Dense, brown, fine to coarse sand, trace of silt, moist														
3.0			244	2	SS	30/75mm									
3.65															
	<u>BEDROCK</u> :		243	3	RC		310	100	67	100					
				4	RC		230	100	0	100					
4.5				5	RC		430	88	71	100					
	Description to be provided in final report.			6	RC		210	80	0	100					
			242	7	RC		680	100	89	100					
				8	RC		940	94	11	100					
6.0			241	9	RC		840	100	67	100					
			240	10	RC		530	100	48	100					
7.5							100	100	57	100					
			239	11	RC		480	100	42	100					
9.0			238	12	RC		840	100	82	100					
9.37	BOREHOLE TERMINATED AT 9.37m.		237												
10.5															
12.0															
13.5															
15.0															
16.5															

NOTE :

Site number as well as the
Northing and Easting will be
included with the final report.

NOTES:

CHECKED BY:

LOG OF BOREHOLE NO. 6

PROJECT G. W. P. 291-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE

OUR PROJECT 98TF010

SITE Black Road Underpass, Site

LOCATION Station 10+004 (Black Road) 6.5 m Rt. Centreline Median

BORING DATE August 27, 1998

ENGINEER

E. Wong

BORING METHOD Continuous Flight Hollow Stem Augers

TECHNICIAN

M. Rapsey

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 *		WATER CONTENT %		
							BLOWS/0.3M		WATER CONTENT %		
							20	40	60		80
0	GROUND ELEVATION 247.05										Upon completion of augering, free water at 1.50m.
	<u>SAND AND GRAVEL FILL</u> : Dark brown sand and gravel with organic inclusions, some silt		246	1	SS	6					
1.50											
1.91	<u>SAND</u> : Compact, brown sand, some silt, trace of gravel, saturated		245	2	SS	10/150mm					
	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 1.91m. 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:

LOG OF BOREHOLE NO. 7

PROJECT G. W. P. 291-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Black Road Underpass, Site
LOCATION Station 10+045 (Black Road) 6.0 m Lt. Centreline Median
BORING METHOD Continuous Flight Hollow Stem Augers

OUR PROJECT 98TF010
BORING DATE August 25, 1998
ENGINEER E. Wong
TECHNICIAN M. Rapsey

SOIL PROFILE			SAMPLES		SHEAR STRENGTH C_u	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			
0	GROUND ELEVATION 248.57						
0.10	TOPSOIL : Dark brown, silty sand, high organic SAND : Compact, brown, fine to coarse sand, some silt, some gravel, moist BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 0.45m. BEDROCK ASSUMED. NOTE : Site number as well as the Northing and Easting will be included with the final report.		248				Upon completion of augering, no free water, no cave.
0.45							
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:

LOG OF BOREHOLE NO. 8

PROJECT G. W. P. 291-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Black Road Underpass, Site
LOCATION Station 10+056 (Black Road) 6.0 m Lt. Centreline Median
BORING METHOD Continuous Flight Hollow Stem Augers & NQ Rock Coring

OUR PROJECT 98TF010
BORING DATE August 25, 1998
ENGINEER E. Wong
TECHNICIAN M. Rapséy

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							
	GROUND ELEVATION 244.55						20	40	60	80	10	20	30	
0														
0.10	TOPSOIL : Dark brown, silty sand, high organics		244											
				1	SS	12								
1.50	SAND : Compact, brown, fine to coarse sand, some silt, some gravel, clayey silt seams, saturated		243	2	SS	2								
2.30	CLAY : Very soft, brown, clay, high plastic, W.T.P.L.		242	3	SS	36								
3.0	SAND : Dense, brown fine to coarse sand, some gravel, trace of silt, wet		241	4	SS	48								
3.99														
4.5	BEDROCK : Description to be provided in final report.		240	5	RC		680	100	74	100				
				6	RC		1450	100	63	100				
6.0				7	RC		310	100	83	100				
				8	RC		780	97	93	100				
7.21														
7.5	BOREHOLE TERMINATED AT 7.21m.		237											
8.0														
10.5														
12.0														
13.5														
15.0														
16.5														

NOTE :

Site number as well as the Northing and Easting will be included with the final report.

NOTES:

CHECKED BY:

LOG OF BOREHOLE NO. 9

PROJECT G. W. P. 291-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
 SITE Black Road Underpass, Site
 LOCATION Station 10+065 (Black Road) 6.5 m Lt. Centreline Median
 BORING METHOD Continuous Flight Hollow Stem Augers

OUR PROJECT 98TF010
 BORING DATE August 26, 1998
 ENGINEER E. Wong
 TECHNICIAN M. Rapsey

SOIL PROFILE			SAMPLES		SHEAR STRENGTH C_u	LIQUID LIMIT W_L			GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER		PLASTIC LIMIT W_P	WATER CONTENT W	WATER CONTENT %	
	GROUND ELEVATION 244.65								
0									
0.25	TOPSOIL : Dark brown, silty sand, high organic		244	1	AS				Upon completion of augering, no free water, no cave.
0.76	SAND : Compact, brown, fine to coarse sand, some silt, some gravel, moist		243						
1.5									
3.0	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 0.76m. BEDROCK ASSUMED.								
4.5	NOTE : Site number as well as the Northing and Easting will be included with the final report.								
6.0									
7.5									
9.0									
10.5									
12.0									
13.5									
15.0									
16.5									

NOTES:

CHECKED BY:

LOG OF BOREHOLE NO. 10

PROJECT G. W. P. 291-97-00, HIGHWAY 69, DISTRICT 52, HUNTSVILLE
SITE Black Road Underpass, Site
LOCATION Station 10+077 (Black Road) 6.0 m Rt. Centreline Median
BORING METHOD Continuous Flight Hollow Stem Augers

OUR PROJECT 98TF010
BORING DATE August 26, 1998
ENGINEER E. Wong
TECHNICIAN M. Rapsey

SOIL PROFILE			SAMPLES		SHEAR STRENGTH C_u	LIQUID LIMIT W_L			GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER		PLASTIC LIMIT W_P	WATER CONTENT W	WATER CONTENT %	
	GROUND ELEVATION 245.20								
0									
0.15	TOPSOIL : Dark brown, silty sand, high organic		245						Upon completion of augering, free water at 1.90m.
				1	SS	30			
1.50	SAND : Dense, brown, fine to coarse sand, some silt, some gravel, moist		244						
				2	SS	34			
2.03	becoming grey, saturated		243						
	BOREHOLE TERMINATED UPON REFUSAL TO AUGER AT 2.03m. BEDROCK ASSUMED.								
3.0									
	NOTE : Site number as well as the Northing and Easting will be included with the final report.								
4.5									
6.0									
7.5									
9.0									
10.5									
12.0									
13.5									
15.0									
16.5									

NOTES:

CHECKED BY:

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

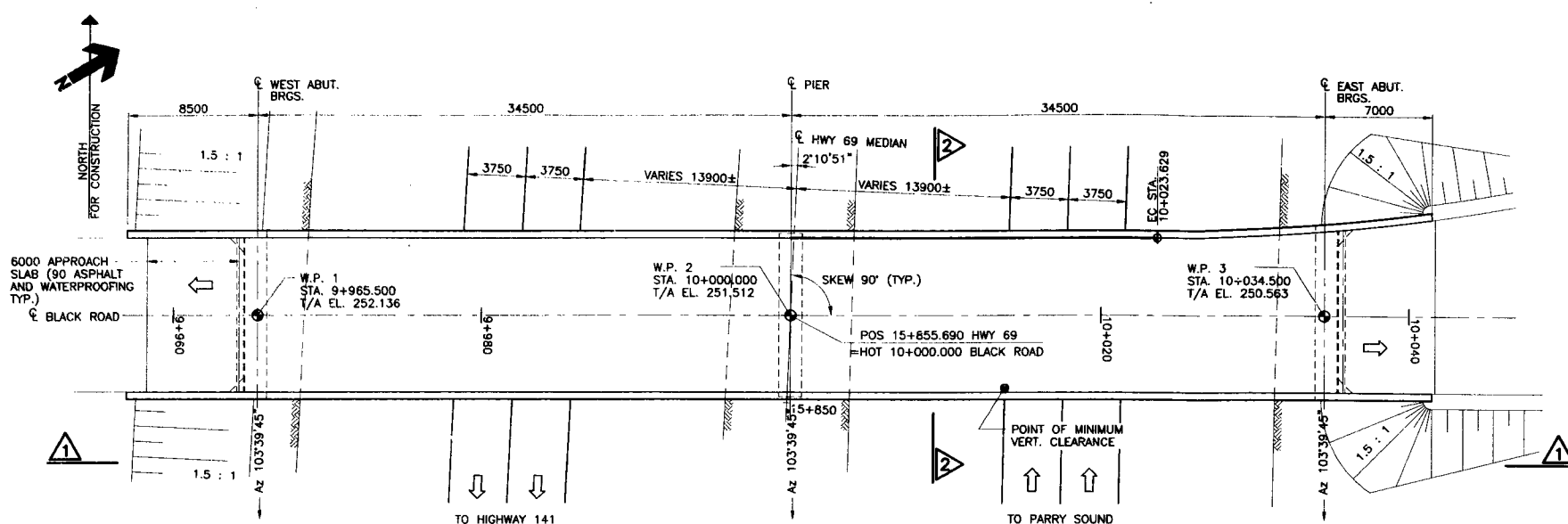


DIST 52
CONT No.
WP No. 423-98-01

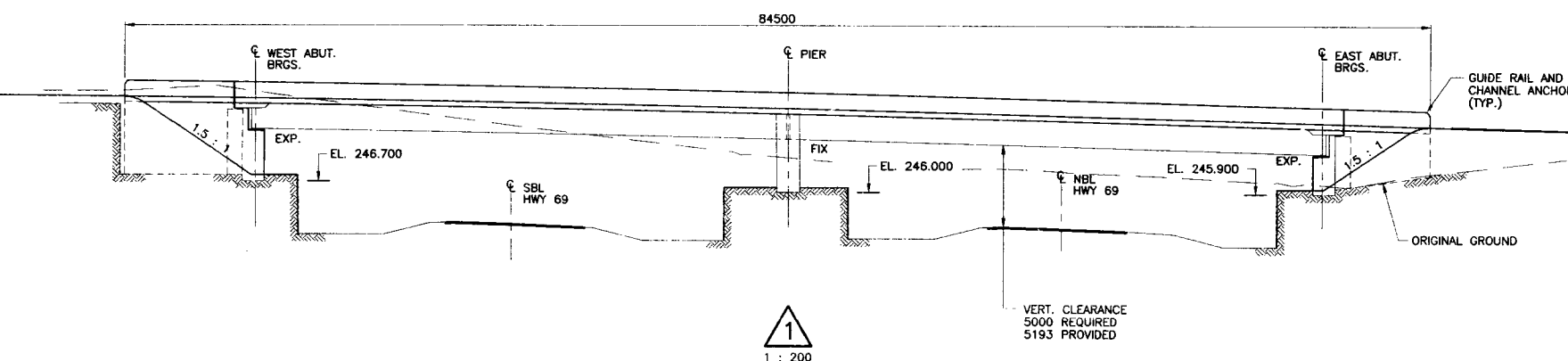


HIGHWAY 69
BLACK ROAD STRUCTURE
PRELIMINARY
GENERAL ARRANGEMENT

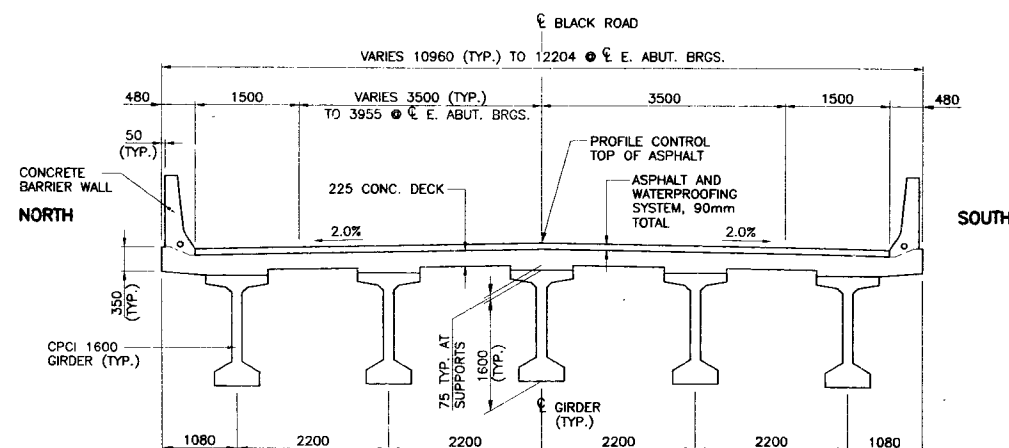
SHEET



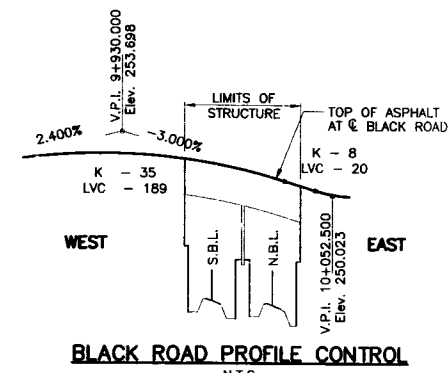
PLAN
1 : 200



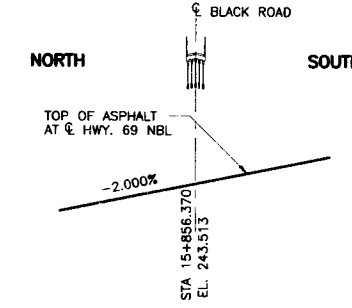
1
1 : 200



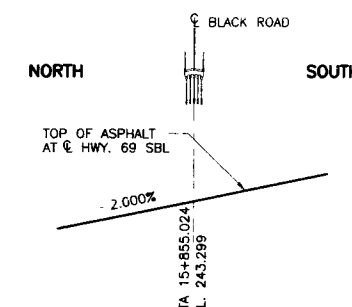
2
1 : 50



BLACK ROAD PROFILE CONTROL
N.T.S.



HWY 69 NBL PROFILE CONTROL
N.T.S.



HWY 69 SBL PROFILE CONTROL
N.T.S.

DHO B.M. 173-69 ELEV. 245.621
TABLET IS SET VERTICAL IN TOP OF ROCK
WEST SIDE OF HWY. 69, 5 km NORTH OF JCT.
OF HWYS. 69 AND 141 AT HAYES CORNERS,
14 m NORTH OF BLACK RD. & 24 m WEST
OF CENTERLINE OF HWY. 69

GENERAL NOTES

- CLASS OF CONCRETE:
-PRECAST GIRDERS 50 MPa
-FOOTINGS 30 MPa
-REMAINDER 50 MPa (HPC)
- CLEAR COVER TO REINFORCING STEEL:
-FOOTINGS 100±25
-DECK TOP 70±20
-BOTTOM 40±10
-REMAINDER 70±20
(UNLESS NOTED OTHERWISE)
- REINFORCING STEEL
REINFORCING STEEL SHALL BE GRADE 400 UNLESS NOTED OTHERWISE. BARS MARKED WITH PREFIX 'S' DENOTE STAINLESS STEEL BARS.
TENSION LAP LENGTHS NOT INDICATED ON THE CONTRACT DWGS. SHALL BE CLASS B.
HOOKS AND BENDS FOR REINFORCING STEEL SHALL BE DETAILED ACCORDING TO OHBDC-91. UNLESS SHOWN OTHERWISE, THE FOLLOWING SHALL APPLY:
a) STANDARD HOOKS WITH MINIMUM BEND DIAMETERS SHALL BE USED FOR STIRRUPS AND TIES. ACCORDING TO CLAUSE 8-14.1
b) OTHER BARS SHALL HAVE STANDARD HOOKS WITH BEND DIAMETERS ACCORDING TO CLAUSE C8-14.1
- CONSTRUCTION NOTE:
THE CONTRACTOR SHALL ESTABLISH THE BEARING SEAT ELEVATIONS BY DEDUCTING THE ACTUAL BEARING THICKNESSES FROM THE TOP OF BEARING ELEVATIONS. IF THE ACTUAL BEARING THICKNESSES ARE DIFFERENT FROM THOSE GIVEN WITH THE BEARING DESIGN DATA, THE CONTRACTOR SHALL ADJUST THE REINFORCING STEEL TO SUIT.
- NO BACKFILL SHALL BE PLACED UNTIL DECK CONCRETE HAS REACHED 75% OF ITS SPECIFIED STRENGTH. BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH ABUTMENTS KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500 mm.

LEGEND

W.P. DENOTES WORK POINT
T/A DENOTES TOP OF ASPHALT
T/F DENOTES TOP OF FOOTING

LIST OF DRAWINGS

- GENERAL ARRANGEMENT
- BOREHOLE LOCATION AND SOIL STRATA
- FOUNDATION LAYOUT & DETAILS
- WEST ABUTMENT
- EAST ABUTMENT
- WINGWALLS
- PIER DETAILS
- PRESTRESSED CPCI GIRDERS AND BEARINGS
- DECK LAYOUT AND DETAILS
- DECK REINFORCING
- BARRIER WALL W/O RAILING
- 6000mm APPROACH SLABS
- ELECTRICAL EMBEDDED WORK
- QUANTITIES - STRUCTURE I
- QUANTITIES - STRUCTURE II

APPLICABLE STANDARD DRAWINGS

OPSD-902.07 STEEL BEAM GUIDE RAIL STRUCTURE CONNECTION
OPSD-3501.00 GRANULAR BACKFILL REQUIREMENTS
OPSD-4010.00 GUIDE RAIL AND CHANNEL ANCHORAGE



DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	MLT/CHK	JCL	CODE
DRAWN	RCS/CHK	MLT	SITE
			44-401/STRUCT
			SCHEME
			DWG. P-1

DEC 16 1998