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31C-174

FINAL REPORT

FOUNDATION INVESTIGATION
AND DESIGN
HIGHWAY 7 ROAD EMBANKMENTS
VARIOUS LOCATIONS
W.P. 129-80-00
0.6 KM WEST OF
TOWNSHIP ROAD 38 to WEYMYSS

Morrison Hershfield Limited

PROJECT NO. ONO11802
GEOCRES NO. 31C-174

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PROJECT NO. ONO11802

FINAL REPORT – FOUNDATION INVESTIGATION AND DESIGN

TO

**Morrison Hershfield Limited
2440 Don Reid Drive
Ottawa, Ontario
K1H 1E1**

ON

**Highway 7 – Road Embankments
Various Locations
W.P. 129-80-00
Bancroft Area
Ministry of Transportation
Ontario
Geocres No. _____**

September 2006

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PART A – FOUNDATION INVESTIGATION REPORT

FINAL FOUNDATION INVESTIGATION REPORT

for

W.P. 129-80-00

Highway 7 Road Embankments, Various Locations
Between 0.6 km west of Township Road 38 and Wemyss

Township of Central Frontenac

Bancroft Area

1.0 INTRODUCTION

This report was prepared for Highway 7 embankment design at various locations within the Township of Central Frontenac (former Oso Township), Ontario.

This report presents the results of a foundation investigation carried out to address proposed roadway widening at five locations where the existing embankment height exceeds 5 m.

The foundation investigation was carried out in accordance with MTO approved scope of work submitted on June 21, 2005. Authorization to proceed was provided on August 2, 2005 by the Ministry of Transportation of Ontario (MTO) under Agreement Number 4005-E-0016 with Morrison Hershfield Limited (MHL), the Prime Consultant for this project.

This report has been prepared specifically and solely for the project described herein. It contains factual information pertaining to the subsurface conditions which was obtained as part of this investigation.

2.0 SITE DESCRIPTION AND GEOLOGY

The project site is located between 0.6 km west of Township Road 38 and Wemyss, in the Township of Frontenac, Township of Central Frontenac (formerly known as Oso Township), Ontario, within the limits of MTO project W.P. 129-80-00 (Highway 7). The site location is shown on the Key Plan inset to Drawing No. ONO11802-1 provided in Appendix A. It is noted that for project orientation purposes, Highway 7 will be assumed to run west-east, with chainage increasing easterly.

This section of Highway 7 is located in the general physiographic area known as Frontenac Axis. This geological area is part of the Canadian Shield, extending south-eastward from the Algonquin Dome in central Ontario to the Adirondack Mountains of New York State, crossing the St. Lawrence River.

Although the overburden in the area is generally shallow, the thickness over the bedrock can vary greatly over short distances. The bedrock, consisting of Precambrian rocks with undifferentiated igneous and metamorphic rock, is frequently exposed at surface or covered by a thin discontinuous layer of glacial drift. The overburden is generally a sandy loam. Some muck/peat deposits are usually observed in shallow lakes, ponds, swamps, and undrained wetlands along Highway 7. Rock outcrops and associated shallow soil, rough topography, stones and swamp are recorded in *The Physiography of Southern Ontario, Third Edition, 1984, Ontario Geological Survey Special Volume 2*.

The area generally slopes downward from east to west. Topography of the area is moderately sloping and reflects the bedrock relief.

The project limits of the study area are shown on Drawing No. ONO11802-1, Appendix A.

For the ease of reference, this investigation was divided into five areas listed below, using MTO chainage systems. All five sections are located within Central Frontenac Township, Ontario.

- Area 1 (proposed 12 m embankment): Stations 14+705 to 14+840 EBL
- Area 2 (proposed 10m embankment): Stations 15+000 to 15+090 EBL
- Area 3 (proposed 10 m embankment): Stations 15+300 to 15+400 EBL
- Area 4 (proposed 10m embankment): Stations 16+920 to 17+000 WBL
- Area 5 (proposed 5 m embankment): Stations 17+260 to 17+400 WBL

3.0 PROCEDURE

3.1 Field Investigation

Prior to commencement of the field drilling, the borehole locations were established in the field and cleared of existing underground services.

The site soil conditions were investigated with a borehole drilling investigation and laboratory testing program. Due to accessibility limitations, a portable drill rig was employed between September 1 and September 21, 2005. At one location the drilling rig was mounted on a raft due to the presence of standing water.

Fourteen (14) boreholes, BH 05-1 through BH 05-14, were put down at the selected locations. All boreholes were advanced to depths outlined in the scope of work.

The boreholes were advanced through the overburden using solid stem augers cased to a maximum depth of approximately 5 m, or practical refusal if shallower. The subsurface conditions were visually examined and recorded in the field by Jacques Whitford Limited (JW) personnel. Standard Penetration Tests (SPT) (ASTM D1586) were carried out at regular intervals (760 mm at shallow depths to 1.5 m below 3 m depth). The SPT 'N' values are corrected by multiplying 0.33 to account for the reduced weight of the driving hammer. Soil samples were acquired from the Split Spoon Sampler. The recovered soil samples were stored in moisture proof containers and returned to our Ottawa laboratory. The subsurface conditions encountered are described in detail in the Borehole Records presented in Appendix B.

Standpipes were installed to monitor the groundwater levels. All boreholes were backfilled with auger cuttings upon completion of the investigation.

3.2 Survey

Borehole locations and elevations were established in the field with respect to MTO chainages or existing Benchmarks by JW personnel. The elevations of bench marks were provided by Morrison Hershfield with geodetic elevations.

3.3 Laboratory Testing

All samples returned to the laboratory were subjected to detailed visual classification by a geotechnical engineer. MTO specified routine testing, consisting of moisture content testing, and grain size distribution analysis was carried out on representative samples.

No complex testing was deemed to be necessary based on the soil conditions.

All soil samples will be stored for a period of one year after issuance of the final version of the foundation investigation report. Unless otherwise directed, the stored samples will be disposed of after this period.

4.0 RESULTS

4.1 Existing Embankment Conditions

The existing embankment conditions site which were observed to vary from site to site, are summarized in Table 4.1. The embankment and drainage conditions were visually inspected at the time of the field investigation. The heights and widths at the locations are estimated from the typical road cross sections provided by Morrison Hershfield.

Table 4.1: Embankments General Conditions, Central Frontenac Township

	Maximum Height (m)	Maximum Width (m)	Existing Side slopes	Embankment material at toe	Vegetation and drainage condition
Area 1 14+705 to 14+840 EBL	12.3	24.3	1.5H:1V to 3.6H:1V	Rock Fill	Grass, light vegetation
Area 2 15+000 to 15+090 EBL	10.2	21.5	2.0H:1V to 2.1:1V	Rock Fill	Grass, light vegetation standing water
Area 3 15+300 to 15+400 EBL	7.3	17.6	1.80H:1V to 2.4H:1V	Rock Fill, Earth Fill	Trees, Bushes, light vegetation
Area 4 16+920 to 17+000 WBL	6.9	12.4	1.5H:1V to 5.9H:1V	Earth Fill	Shrubs light vegetation
Area 5 17+260 to 17+400 WBL	7.77	11	1.0H:1V to 3.4H:1V	Earth Fill	Grass, light vegetation

4.2 Subsurface Profile

The subsurface conditions observed in the boreholes are presented in detail on the Borehole Records provided in Appendix B. An Explanation of Terms Abbreviations and Symbols Used in Report is also provided.

Borehole Location Plans and Stratigraphical Plots are provided in Appendix A.

4.2.1 Area 1 (BH 05-01 through 05-04), 14+705 to 14+840 EBL

BH 05-01 was located at Station 14+720 eastbound side toe of slope. BH 05-02 and BH 05-03 boreholes were located at Station 14+770 eastbound side toe of slope and 5 m beyond toe of slope, respectively. BH 05-04 was located at Station 14+820 eastbound side toe of slope. BH 05-03 was advanced to approximately 5.2 m depth. BH 05-01, 05-02 and 05-04 were terminated at shallower depth at refusal to auger.

4.2.1.1 Surficial Material

A surficial layer/veneer of organics/rootmats/topsoil was observed at all four borehole locations. A layer of sand with silt fill (SP-SM) material ranging in thickness from 500 mm to 2.1 m was encountered below the topsoil. Silt, gravel and organic matters were observed throughout this fill layer. The relative compactness of the fill is very loose to loose, having SPT-N values ranging from 1 to 8 blows per 300 mm of penetrations. In BH 05-03 (STN 14+770 28 m right of central line), a thin layer of peat and clay were observed at approximate depth of 1.2 m and 2.2 m, respectively.

4.2.1.2 Silty Sand

Native silty sand with gravel was observed in BH 05-01 and BH 05-03 below the fill material. The sand extended to depths ranging from 1.8 m to 3.1 m below ground surface (El. 196.0 m to 195.5 m) at BH 05-1 and 05-3 respectively. This native sand contained variable amounts of gravel, silt and occasional cobbles. The relative compactness of this deposit is loose to compact, having SPT-N values from 8 to 13 blows per 300 mm of penetration. Particle size analysis conducted on one selected sample, indicated this soil contains 16 percent gravel, 54 percent sand, 27 percent silt size particles and 3 percent clay size of particles. It is classified as silty sand with some gravel in accordance with the MTO Soil Classification Systems (1979).

4.2.1.3 Sand with Silt and Gravel (Glacial Till)

A heterogeneous and well graded mixture of sand with silt and gravel (SW-SM) was encountered in BH 05-01 and BH 05-03. This till deposit extended to a depth of 2.0 m (El. 195.8 m) in BH 05-1 and to the planned borehole termination of 5.2 m (El. 193.4 m) in BH 05-3. The relative compactness of the till deposit is compact to dense, having SPT-N values ranging from 19 blows per 300 mm of penetration to greater than 19 blows per 150 mm of penetration. Particle size analyses conducted on two selected samples indicated the till consists of 3 to 15 percent gravel, 72 to 89 percent sand and 8 to 12 percent silt/clay size particles. It is classified as sand with some gravel and/or silt in accordance with the MTO Soil Classification Systems (1979)(SM).

4.2.1.4 Bedrock

Bedrock was inferred during the investigation upon refusal to auger or split spoon. Bedrock Elevations were observed to vary from 193.35 m to 200.88 m at the various borehole locations, as noted on the borehole logs.

4.2.1.5 Groundwater

Groundwater level was measured in the standpipes on September 5, 2005, three days after borehole completion. The 'stabilized' groundwater was encountered at approximately 1.0 m below ground surface at BH 05-02 and 05-03.

4.2.2 Area 2 (BH 05-13 and BH 05-14), 15+000 to 15+090 EBL

BH 05-13 and BH 05-14 were located at Station 15+035 eastbound side toe of slope and 5 m beyond toe of slope, respectively. Approximately 1 m of standing water was encountered at both borehole locations.

4.2.2.1 Surficial Material

Peat or very soft, highly compressible material was encountered at BH 05-13 to a depth of 0.9 m below ground surface. In BH 05-14, peat was found from ground surface to 1.0 m depth.

A layer of silty sand with gravel (SM) ranging in thickness from 600 mm to 1.8 m underside at (El. 204.7 m) was encountered below the peat. This fill consists of gravel, some sand and trace of silt in BH 05-13. In BH 05-14, it consists of sand, with some silt. The relative compactness of the fill is very loose to compact, having SPT-N values ranging from 1 to 13 blows per 300 mm of penetration. Occasional clay layers or seams were observed within the fill layer. Particle size analysis conducted on one selected sample indicated that this fill consists of 3 percent of gravel, 67 percent of sand and 30 percent of silt/clay size particles. Moisture content of this sand was 20 percent based on the representative sample tested.

4.2.2.2 Gravel, Sand, Silt and Clay (Glacial Till)

Heterogeneous mixture of gravel, sand, silt and clay was encountered in BH 05-13. The relative compactness of the till deposit is compact to dense, having SPT-N values ranging from 13 blows per 300 mm of penetration to greater than 33 blows per 75 mm of penetration. Moisture content of the till was 20 percent based on the representative sample tested.

4.2.2.3 Bedrock

Bedrock was inferred during the investigation upon refusal to auger or split spoon. Bedrock Elevations were observed to vary from 206.15 m to 206.50 m at the various borehole locations, as noted on the borehole logs.

4.2.2.4 Groundwater

Groundwater levels were not measured in the open boreholes due to cave-in conditions. As noted above approximately 1 m of standing water was present at these borehole locations.

4.2.3 Area 3 (BH 05-05 through BH 05-08), 15+300 to 15+400 EBL

BH 05-08 was located at Station 15+320 eastbound toe of slope. BH 05-06 and BH 05-07 were located at Station 15+350 eastbound toe of slope and 5 m beyond toe of slope, respectively. BH 05-05 was located at Station 15+380 eastbound side toe of slope. All four boreholes were advanced to depths ranging from 4.9 m to 5.2 m.

4.2.3.1 Surficial Material

A thin layer of topsoil approximately 0.1 m in thickness was observed at all four borehole locations. Approximate 1.1 m thick of mixed fill was encountered under the topsoil layer extending to elevations ranging from 212.3 m to 213.7 m in BH 05-5, 05-7 and 05-8. This fill was observed to be of variable composition of gravel, sand and silt contents and ranged from a silty sand (SM) to a sandy silt (ML). The relative compactness of the fill is very loose to loose, having SPT-N values ranging from 1 to 6 blows per 300 mm of penetration. Occasional silt, clay, organic matters or peat layers were observed throughout the fill layer. Three particle size analyses conducted on the selected samples indicated that the fill consists of 0 percent to 32 percent gravel, 23 to 92 percent sand and 8 to 65 percent silt/clay size particles. Moisture contents of this fill vary from 2 percent to 21 percent based on the representative samples tested.

An underlying fill was observed in BH05-5. This material is likely associated with construction of the nearby culvert. This fill is coarser than the overlying material according to the two particle size analyses, and consists of 35 to 41 percent gravel, 53 to 60 percent sand and 5 to 6 percent fines (silt and/or clay particles). It is classified as poorly graded sand with gravel (SP-SM) accordance with the MTO Soil Classification Systems (1979). Field observations included occasional peat and clay seams within this unit. The compactness of the deposit is loose to dense, having SPT-N values ranging from 7 to 41 blows per 300 mm of penetration. Moisture contents of the sand vary from 14 to 16 percent based on the samples tested.

4.2.3.2 Sand

A sand layer was observed in BH05-5, 05-7 and 05-8, extending from the bottom of the fill to beyond the termination depth (approximately 5 m) of the boreholes.

In BH 05-05 (Station 15+380 toe of slope), this fill appeared to be very compact to dense, having SPT-N values ranging from 14 to 34 blows per 300 mm of penetration. Very low blows were recorded at depth in BH05-8 however these values are interpreted to have been affected by groundwater flow into the borehole. Two particle size analyses conducted on the selected samples indicated that the unit consists of 1 to 7 percent gravel, 85 to 88 percent sand and 5 to 14 percent fines (silt and/or clay particles). It is classified as a well-graded sand with some silt (SW-SM) in accordance with the MTO Soil Classification Systems (1979). Moisture contents of this sand vary from 4 to 11 percent based on the selected samples tested.

In BH 05-07 and 05-08, this deposit appeared to be poorly graded, with 56 percent sand and 44 percent silt particles. It is classified as silty sand (SM) in accordance with the MTO Soil Classification Systems (1979). The relative compactness of the deposit was compact to very loose. Field sampling and SPT N-values obtained indicated that the deposit was sensitive to disturbance and can lose its strength substantially. Moisture content of the deposit was 20 percent based on the selected sample tested.

4.2.3.3 Bedrock

Bedrock was not encountered in any boreholes at this location.

4.2.3.4 Groundwater

The groundwater level was measured in the standpipe at BH 05-06, on October 4, 2005, 4 weeks after the borehole completion. The groundwater was approximately 1.4 m below ground surface (El. 213.3 m) at that time.

4.2.4 Area 4 (BH 05-09A and BH 05-10A), 16+920 to 17+000 WBL

BH 05-09A and 05-10A were located at Station 16+925 westbound toe of slope and 5 m beyond toe of slope, respectively. Both boreholes were advanced to split spoon refusal.

4.2.4.1 Surficial Material

A thin layer of topsoil (100 mm) was observed at four borehole locations. Approximate 500 mm to 900 mm thick of mixed fill was encountered below the topsoil layer and extended down to Elevations 209.2 m and 209.8 m Geodetic. This fill was observed to consist of silty sand (SM). The relative compactness of the fill is very loose, having a SPT-N value of 1 blow per 300 mm of penetration. Organic matter was observed throughout the fill layer. Particle size analysis conducted on one selected sample indicated that the fill consists of 4 percent gravel, 61 percent sand and 35 percent silt/clay size particles. Moisture content of this fill was 7 percent based on the representative samples tested.

4.2.4.2 Bedrock

Bedrock was inferred at depths of 1.0 and 0.6 m during the investigation upon refusal to split spoon. Bedrock Elevations were observed to vary from 209.20 m to 209.85 m at the borehole locations, as noted on the borehole logs.

4.2.4.3 Groundwater

Groundwater levels were not measured in the open boreholes.

4.2.5 Area 5 (BH 05-11 and BH 05-12), 17+260 to 17+400 WBL

BH 05-11 and BH 05-12 were located at Station 17+375 westbound toe of slope and 5 m beyond toe of slope, respectively. Both boreholes were advanced to split spoon refusal.

4.2.5.1 Surficial Material

Peat was found from ground surface to approximately 300 mm to 500 mm depth (extending to El. 196.9 m and 197.0 m), at the borehole locations. This black peat was observed to consist of partial decomposed organic materials, presented organic odours, appeared to be very wet and highly compressible.

4.2.5.2 Sandy Silt to Silty Sand

Sandy silt (ML) and silty sand (SM) was encountered below the peat layer. This deposit was observed to consist of variable compositions of sand and silt contents. The relative compactness of the deposit is very loose to loose, having SPT-N values ranging from 1 to 4 blows per 300 mm of penetration. Two particle size analyses conducted on the selected samples indicated that the deposit consists of 0 to 13 percent gravel, 37 to 59 percent sand and 28 to 63 percent silt/clay size particles. Moisture contents of the deposit vary from 22 to 31 percent based on the representative samples tested.

4.2.5.3 Bedrock

Bedrock was inferred during the investigation upon split spoon refusal. Bedrock Elevations were observed to vary from 195.1 m to 194.5 m at the various borehole locations, as noted on the borehole logs.

4.2.5.4 Groundwater

Groundwater level was measured in the standpipe at BH 05-12, on October 4, 2005, 4 weeks after the borehole completion. The groundwater was approximately 0.9 m below ground surface (El. 196.4 m) at the time of the field work.

5.0 CLOSURE

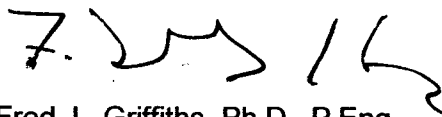
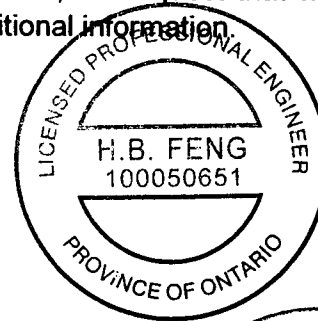
A subsurface investigation is a limited sampling of a site. The subsurface conditions given herein are based on information gathered at the specific borehole locations. Should any conditions at the site be encountered which differ from those at the borehole locations, we request that we be notified immediately in order to assess the additional information.

Yours very truly,

JACQUES WHITFORD LIMITED



Bill Feng, P.Eng.



Fred J. Griffiths, Ph.D., P.Eng.
Designated Principal MTO Foundation Contact



PART B – FOUNDATION DESIGN REPORT

FINAL PRELIMINARY FOUNDATION DESIGN REPORT

for

W.P. 129-80-00

Highway 7 Road Embankments, Various Locations
Between 0.6 km west of Township Road 38 and Wemyss

Bancroft Area

6.0 DISCUSSION

6.1 Proposed Development

It is noted that, for project orientation purposes, Highway 7 is assumed to run east-west across the five embankment widening sites in Central Frontenac Township, with chainage increasing from west to east.

It is understood that the Ministry of Transportation of Ontario (MTO) plans a pavement resurfacing/reconstruction and roadside safety improvement for approximately 26 km of Highway from 0.6 km west of Township Road 38 to Wemyss. The project includes pavement rehabilitation, several new passing lanes, intersection improvements, drainage improvements, etc. As part of this Total Project Management (TPM) and the subsequent Change of Scope dated June 21, 2005, five proposed embankment widening areas along the new passing lanes located within Central Frontenac Township were identified for a foundation investigation, due to the presence of fills exceeding 5 m in height.

The embankment widenings will accommodate the future passing lanes in the five areas. The proposed vertical and horizontal highway alignment was indicated in the proposed preliminary design drawings provided by Morrison Hershfield on October 4, 2005. A summary of the embankment heights, widths and side slopes is provided in Table 6.1.

Table 6.1: Proposed Embankment Heights, Widths and Side Slopes

	Station	Maximum Height (m)	Maximum Width (m)	Proposed Side slopes
Area 1	14+705 to 14+840 EBL	13	16	1.25H:1V to 1.38H:1V
Area 2	15+000 to 15+090 EBL	12.5	16	1.25H:1V to 1.26H:1V
Area 3	15+300 to 15+400 EBL	7	9.5	1.25H:1V to 1.29H:1V
Area 4	16+920 to 17+000 WBL	7	9	1.25H:1V to 2.04H:1V
Area 5	17+260 to 17+400 WBL	8	10.5	1.25H:1V to 2.02H:1V

6.2 Soil Summary

The subsurface profiles at the five areas consisted of the following soils:

Area 1 (BH 05-01 through 05-04): topsoil/sand with silt fill/silty sand/glacial till/bedrock

Area 2 (BH 05-13 and 05-14): peat/ silty sand/glacial till/bedrock

Area 3 (BH 05-05 through 05-08): topsoil/silty sand fill/sand

Area 4 (BH 05-09A and 05-10A): topsoil/silty sand fill/bedrock

Area 5 (BH 05-11 and 05-12): peat/sandy silt to silty sand/bedrock

The SPT N-values indicate that the site soils are very loose to loose over the more 'competent' glacial till. The low N-values observed at these locations are likely reflection of the shallow groundwater conditions. For design purposes, it will be assumed that all surficial organic/peat and loose fill layers will be removed from beneath the embankment footprint and that the existing native silt and sand materials will have a minimum design N-value of 5 blows/300 mm, a unit weight of 18.5 kN/m³ and an angle of internal friction of 29°. The glacial till will be considered to be compact, with a design N-value of 20 blows/300 mm, with a bulk unit weight of 20.0 kN/m³ and an angle of internal friction of 32 degrees.

6.3 Immediate Settlements and 'Long Term' Settlements

Settlement analysis carried out for the study areas are exclusively 'elastic' based on the non-cohesive soil conditions observed in the boreholes.

Stress distribution has been calculated based on a Boussinesq distribution. Due to the non-cohesive nature of the site soils, it is anticipated that settlement will occur rapidly. The Schmertmann approach has been adopted in evaluating the 'long term' settlements for the widened embankment placed on the cohesionless materials. It is noted that the underside of the silty sand layer observed at Area 3 was not encountered at the planned termination depth of the boreholes (5m). For the purpose of the settlement calculations, it has been assumed that bedrock will be encountered at a depth of 10 m below ground surface.

For evaluation purposes, it is assumed that all loose, disturbed fill and 'rejectionable' materials are removed prior to the placement of the embankment fill. The soils in the study areas below the 'rejectionable materials' are, homogeneous, generally compact/dense sand and glacial till or bedrock.

The Modulus of Elasticity has been estimated from the SPT N-values at each site and is used for the settlement assessment only.

Table 6.2: Soil Settlement Parameters

Location	N Blows/300 mm	E MPa
1	13	5
2	13	8
3	8	3
4	33	60
5	5	2

The results of the settlement analysis for the underlying soils are presented in Table 6.3.

Table 6.3: Estimated Settlements Under High Fill Areas

Area	Settlements (mm)						
	New Toe of Slope	Middle of New Slope	New Edge of Shoulder	Location of Maximum Fill Placement	Original Toe of Slope	Original Midslope	Original Edge of Shoulder
Sideslopes of 1.25H:1V							
1	<5	27	28	29	26	29	<5
2	<5	26	25	26	25	26	<5
3	55	182	192	206	192	182	55*
4	<5	<10	<10	<10	<10	<10	<5
5	11	102	97	106	97	102	11
Sideslopes of 2H:1V							
1	<5	31	29	35	40	30	<5
2	<5	29	25	32	37	27	<5
3	45	213	214	251	262	201	60
4	<5	<10	<10	<10	<10	<10	<5
5	7	124	101	131	146	110	11

At Area 3 and Area 5, excessive settlements are indicated due to the presence of underlying layer of loose to compact silt and sand. It is noted that the bedrock at Area 5 is located at approximately 2.8 m below ground surface based on the borehole information. Replacing the loose silt and sand to the bedrock will eliminate the settlement in Area 5.

Given the non-cohesive nature of the underlying soils, settlement will occur relatively quickly.

Post construction settlements of the underlying soils will be less than 25 mm.

Self settlement of the new embankment fill of as much as 10 mm for 3.3 m of fill will occur. This settlement will be complete at the completion of construction.

The construction of the roadway embankment along the proposed passing lane alignment will result in additional settlement of the existing embankment. As noted in Table 6.3 above, it is estimated that settlement at the existing edge of shoulder will be less than 30 mm at all locations.

Settlements below and within the existing embankment under the 'new load' will likely take place during placement.

The variations due to the differences of the physical properties of the borrow materials and its natural water contents, construction rates and methods of fill placement, placement optimum water contents/densities and compactness, and climate conditions, etc. may cause significant difference from this analysis of self settlement.

6.4 Slope Stability Analyses

The software program, Slope/W was used to analyze the slope stability at the five sites.

The Slope Stability Analysis Records for Areas 1 and 2 are provided in Appendix C.

For evaluation purposes, it is assumed that all loose, disturbed fill materials are removed prior to the placement of the embankment fill. The soils in the study areas below the 'rejectionable materials' are generally compact sand and glacial till.

The results of the analyses indicate that slopes at 1.25H:1V or flatter constructed of rock fill are acceptable for Areas 1, 2 and 4. At Areas 3 and 5, flatter slopes are required to maintain an acceptable Factor of Safety. It is recommended that the widening at Areas 3 and 5 be constructed of OPSS Select Subgrade Material and be sloped no steeper than 2H:1V.

The variations due to the differences of the physical properties of the borrow materials and its natural water contents, construction rates and methods of fill placement, placement optimum water contents/densities and compactness, and climate conditions, etc. may cause significant difference from this analysis.

6.5 Liquefaction

The Site soils in Area 3 and Area 5 are characterized as sand and silt. The groundwater measurement indicated the site groundwater level was located near surface during the field investigation.

Table A3.1.7 of the CHBDC indicates that the Zonal Acceleration Ratio for Perth, which is less than 40 km from all of the areas in question, is 0.15.

An assessment of the potential for liquefaction of the soils beneath the embankments was carried out using the See and Idriss (1971) simplified procedure outlined in Section C4.6.2 of the CHBDC. The results of this assessment revealed that generally the soils beneath the embankment would not be classified as liquefiable under a 0.16 g earthquake.

7.0 PRELIMINARY RECOMMENDATIONS

7.1 Embankment Design

The existing and embankment widening slopes are summarized in Table 7.1. As indicated, the proposed slopes will be generally steeper.

Table 7.1: Embankments Slope Changes

	Station	Existing Side Slopes	Proposed Side Slopes
Area 1	14+705 to 14+840 EBL	1.5H:1V to 3.6H:1V	1.25H:1V to 1.4H:1V
Area 2	15+000 to 15+090 EBL	2.0H:1V to 2.1H:1V	1.25H:1V to 1.3H:1V
Area 3	15+300 to 15+400 EBL	1.8H:1V to 2.4H:1V	2H:1V
Area 4	16+920 to 17+000 WBL	1.5H:1V to 5.9H:1V	1.25H:1V to 2.0H:1V
Area 5	17+260 to 17+400 WBL	1.04H:1V to 3.38H:1V	2H:1V

Embankment fill should consist of rockfill or Select Subgrade Material. Rockfill should be sloped to be no steeper than 1.5H:1V where the fill extends below water level and no steeper than 1.25H:1V elsewhere. It is recommended that embankment side slopes should be constructed no steeper than 2H:1V at Area 3 and Area 5.

7.2 Dewatering

It is anticipated that the removal of unacceptable materials will require excavation for the embankments extending below the existing groundwater level. The anticipated excavation depths and the observed groundwater depths are listed in Table 7.2.

Table 7.2: Groundwater vs. Anticipated Excavation Elevations

	Station	Anticipated Excavation Depth (m)	Average Groundwater Depth (m)
Area 1	14+705 to 14+840 EBL	1.5 m to 3.0 m	1 m
Area 2	15+000 to 15+090 EBL	3.0 m	Standing Water
Area 3	15+300 to 15+400 EBL	1.5 m to 3.0 m	1.4 m
Area 4	16+920 to 17+000 WBL	1 m	Not Encountered
Area 5	17+260 to 17+400 WBL	2.5 m to 2.8 m	0.9 m

Provided the embankments are constructed of rockfill, there should be no need for excavation dewatering.

The limits of the excavation should be defined as shown on OPSD 203.030.

7.3 Erosion Protection

Slope protection and drainage measures will be required to ensure the long-term surficial stability of the embankment slopes. Where embankment construction includes earth fill, normal slope vegetation should be established as soon as possible after completion of the embankment fills in order to control surficial erosion.

The contractor should provide silt fences and erosion control blankets, as required, throughout the duration of the construction to prevent silt/sediments from running off the site.

7.4 Other Construction Considerations

Site Grading and Preparation

The CDED manual does not require stripping for embankments over 1.2 m height. The nature of the surficial materials observed at the investigation sites ranged from a topsoil to a peat over 500 mm in thickness. for the areas described in this report stripping is recommended even though the embankment heights exceed 1.2 m

All organic soils and other deleterious materials must be removed from beneath the proposed embankment footprint and/or existing slope surface. Where deleterious materials are encountered, the material should be excavated and replaced with approved materials. The lateral extent of such excavation should include all deleterious material within the embankment footprint.

Benching of the existing slopes as per OPSD 208.010 is recommended.

Excavation

Earth excavation should be carried out in accordance with OPSS-206.07.03. Side slopes for open cut excavations should conform to Occupational Health and Safety Act regulations. The soils to be excavated for the proposed embankments should be considered as a Type 3 to 4 soil. Above groundwater level, temporary cut slopes should be no steeper than 1 horizontal to 1 vertical from the base of the excavation. For excavations below groundwater level, shoring will be required unless workers are prevented from entering the excavations.

8.0 CLOSURE

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review our recommendations when the drawings and specifications are complete.

A soil investigation is a limited sampling of a site. The conclusions given herein are based on information gathered at the specific borehole locations. Should any conditions at the site be encountered which differ from those at the borehole locations, we request that we be notified immediately in order to assess the additional information and its effects on the above recommendations.

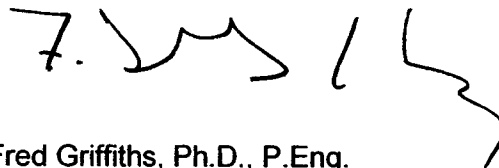
We trust the information presented herein meets your present requirements. Should you have any questions or require additional information, please do not hesitate to contact us.

Yours very truly,

JACQUES WHITFORD LIMITED



Bill Feng, P.Eng.



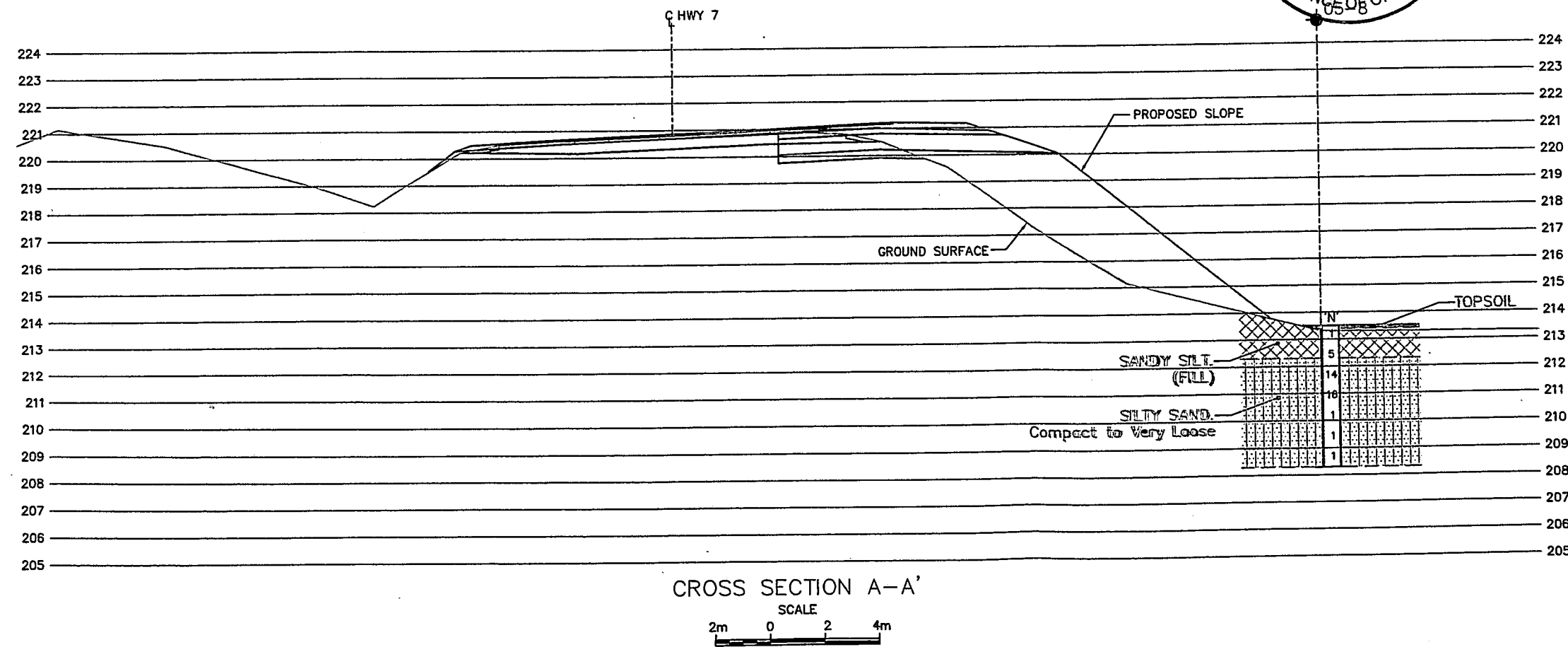
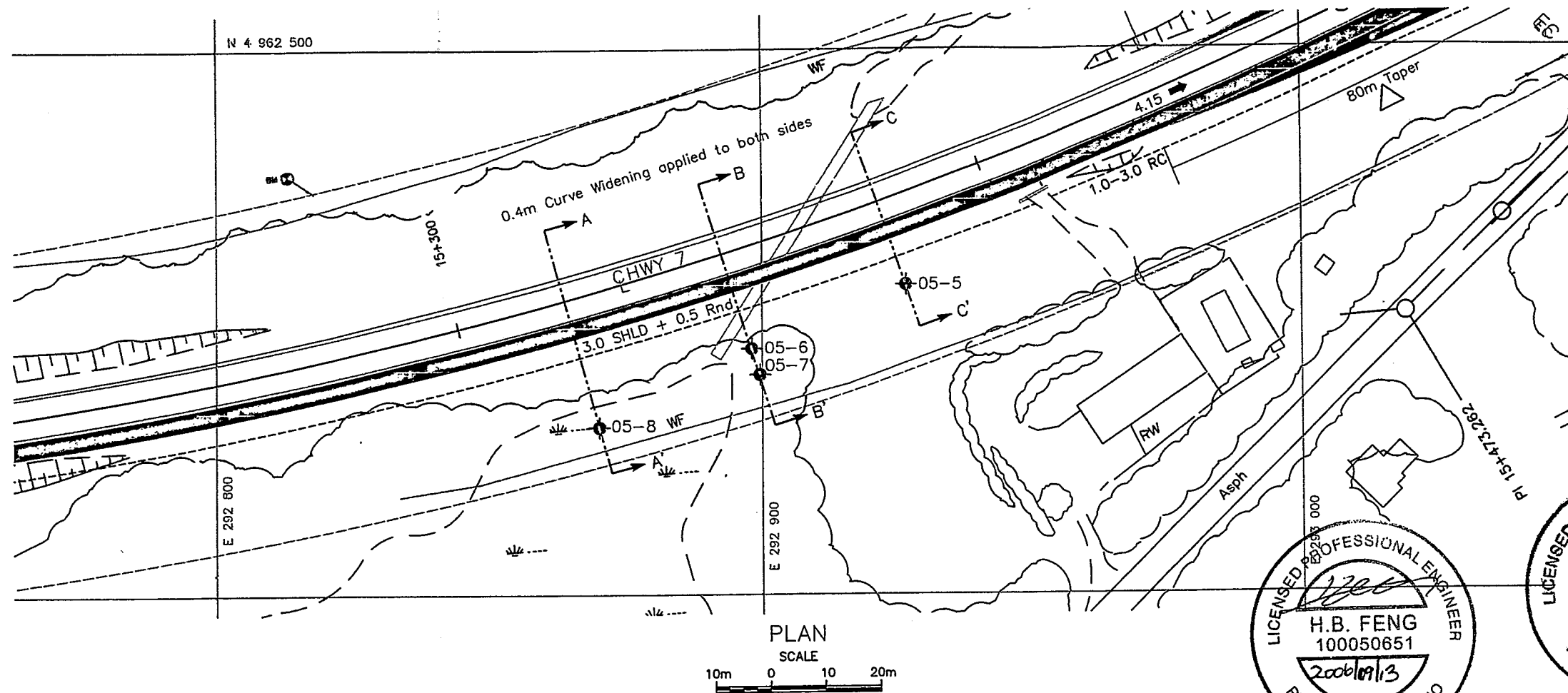
Fred Griffiths, Ph.D., P.Eng.
Designated Principal MTO Foundation Contact



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APPENDIX A

Borehole Location Plans and Stratigraphical Plots



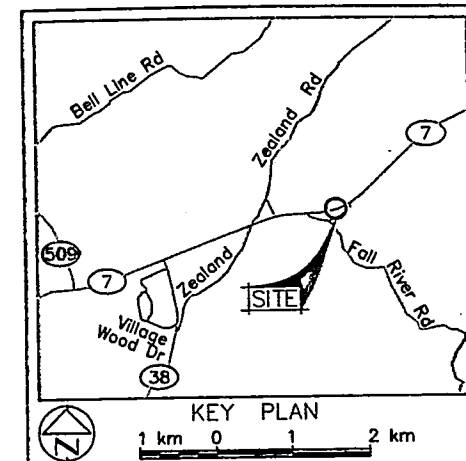
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UNLESS OTHERWISE SHOWN

CONT No
WP No 129-80-00

PROPOSED EMBANKMENT
AREA 3
STA 15+320 TO STA 15+380
BORE HOLE LOCATIONS & SOIL STRATA



✓ Jacques Whitford



LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊕ Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- ↘ WL at time of investigation (Sept 2005)
- ↘ WL in Piezometer
- Piezometer

No	ELEVATION	COORDINATES	
		NORTH	EAST
05-5	216.2	4 962 456.7	292 926.5
05-6	214.7	4 962 445.2	292 898.1
05-7	214.9	4 962 440.4	292 899.6
05-8	213.5	4 962 430.8	292 870.3

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

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

REVISIONS	DATE	BY	DESCRIPTION

GEOCRES No

HWY No 7	DATE 2006/03/24	DIST BANCROFT
SUBM'D BY	CHECKED	SITE
DRAWN GBB	CHECKED	APPROVED

LOWE NO11802-3

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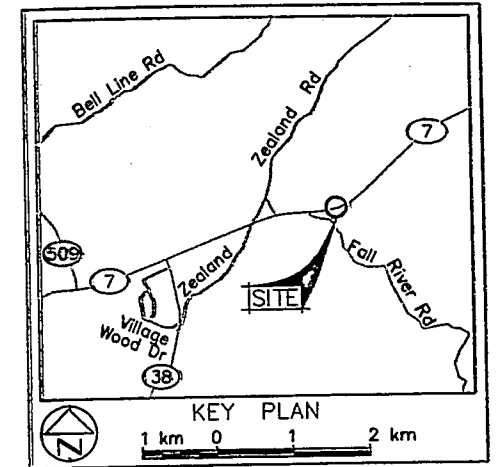
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WP No 129-80-00

PROPOSED EMBANKMENT
AREA 3
STA 15+320 TO STA 15+380
SOIL STRATA



SHEET
4

VW Jacques Whitford



LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊙ Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- ↓ WL at time of investigation (Sept 2005)
- ↑ WL in Piezometer
- ⊥ Piezometer

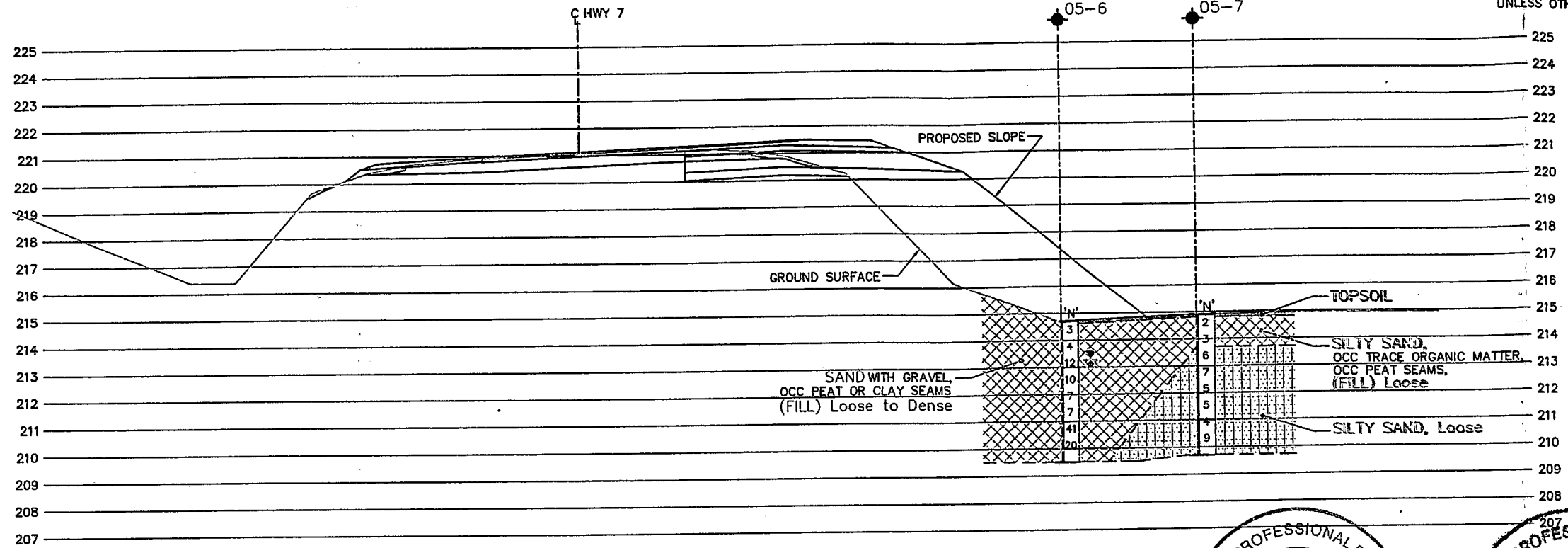
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		NORTH	EAST
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05-6	214.7	4 962 445.2	292 898.1
05-7	214.9	4 962 440.4	292 899.6
05-8	213.5	4 962 430.8	292 870.3

NOTE

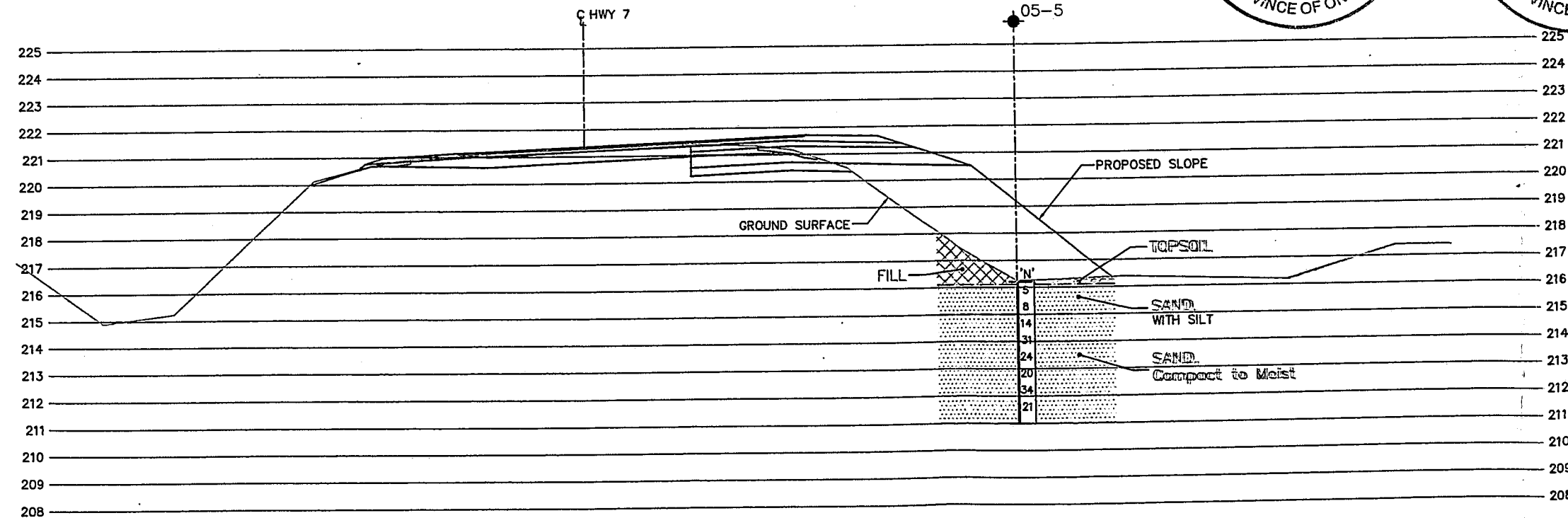
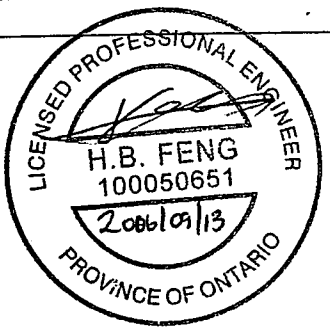
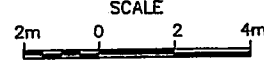
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore holes the boundaries are assumed from geological evidence.

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

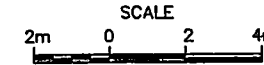
DATE	BY	DESCRIPTION
2006/03/24	BF	DATE 2006/03/24 SITE
2006/03/24	GBB	DRAWN GBB CHECKED DATE 2006/03/24 SITE
GEOCRES No		DIST BANCROFT
HWY No. 7		DATE 2006/03/24 SITE
SUBMITTAL		DWG NO11802-4



CROSS SECTION B-B'



CROSS SECTION C-C'



SHEET
5

Key Plan map showing the location of the site. The map includes Bell Line Rd, Zealand Rd, Harding, and Fallow River Rd. A circled '7' is on Zealand Rd, and a triangle labeled 'SITE' is on Fallow River Rd. A scale bar shows 1 km, 0, 1, 2 km. A north arrow is in the bottom left.

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone

N Blows/0.3m (Std Pen Test, 475 J/blow)

COKE Blows/0.3m (60° Cone, 475 J/blow)

- ↓ W₂ at time of investigation
- ↓ W₂ in Piezometer
- Piezometer

=NOTE=

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

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Historic Office, Denver. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 202-2 of Form 100.

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GDGROSS No. _____

DRIFT No. 7

SWING BF ☒ CHECKED

SWING GBB ☒ CHECKED

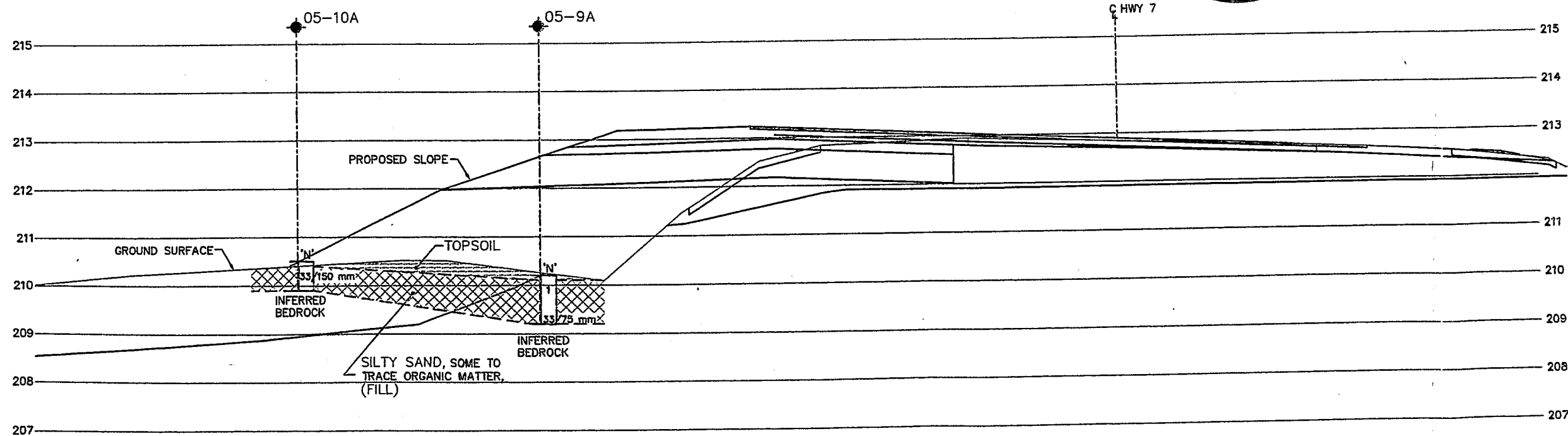
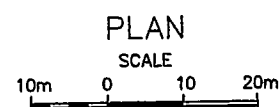
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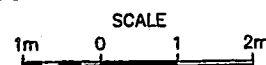
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SITE _____

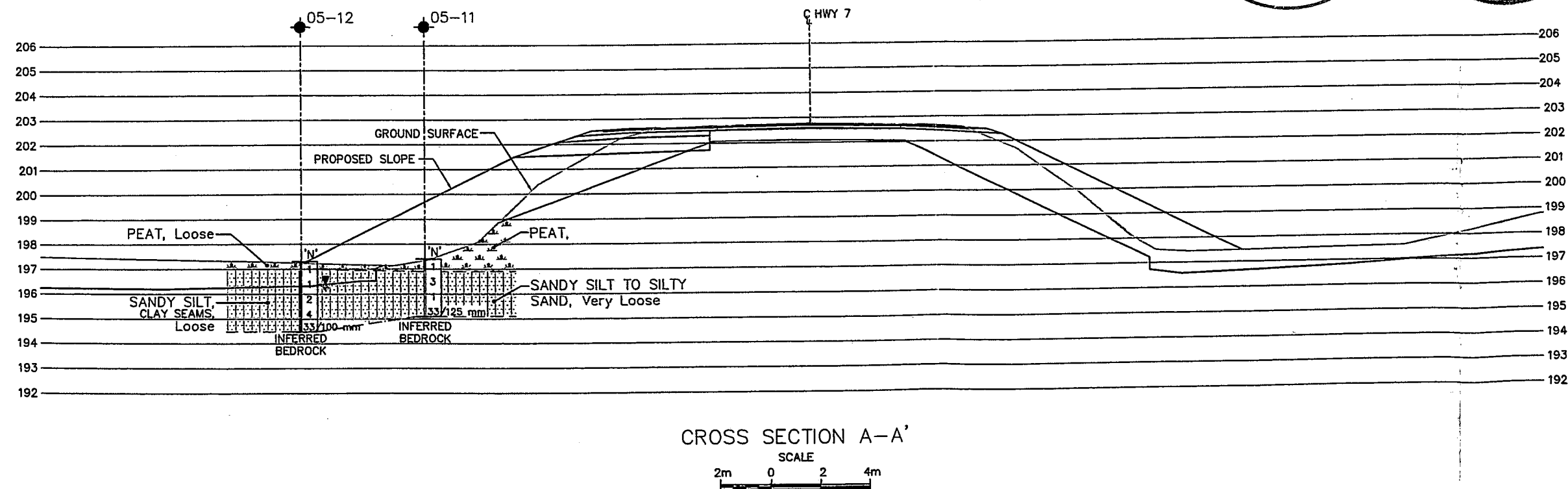
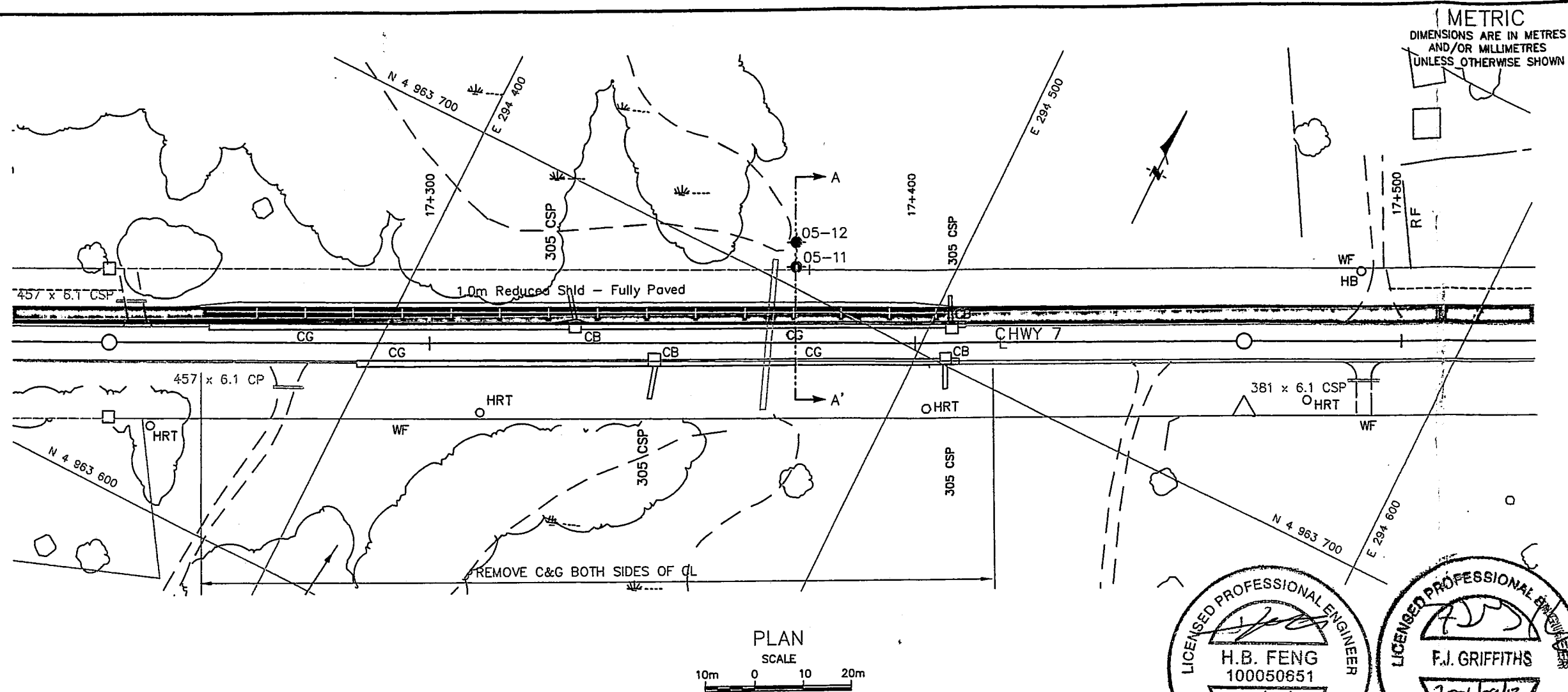
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CROSS SECTION A-A'



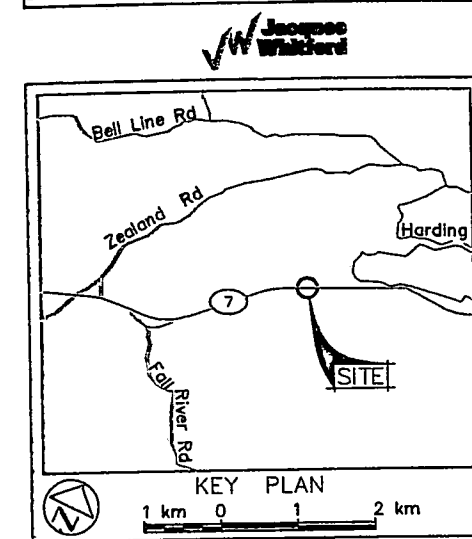
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CONT No
WP No 129-80-00

PROPOSED EMBANKMENT
AREA 5
STA 17+375
BORE HOLE LOCATIONS & SOIL STRATA

SHEET
6



LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- WL at time of investigation (Sept 05)
- WL in Piezometer
- Piezometer

No	ELEVATION	COORDINATES	
		NORTH	EAST
05-11	197.4	4 963 704.0	294 469.5
05-12	197.3	4 963 708.4	294 467.2

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

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

REVISIONS	DATE	BY	DESCRIPTION
1			
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GEOCRES No

HWY No 7

SUBMITTAL CHECKED DATE 2006/03/24 SITE

DRAWN GBB CHECKED APPROVED DIST BANCROFT

DWG NO11802-6

APPENDIX B

Symbols and Terms Used on Borehole Records

Borehole Records

Grain Size Distribution Test Results

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

<i>Topsoil</i>	- mixture of soil and humus capable of supporting vegetative growth
<i>Peat</i>	- mixture of visible and invisible fragments of decayed organic matter
<i>Till</i>	- unstratified glacial deposit which may range from clay to boulders
<i>Fill</i>	- material below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

<i>Desiccated</i>	- having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
<i>Fissured</i>	- having cracks, and hence a blocky structure
<i>Varved</i>	- composed of regular alternating layers of silt and clay
<i>Stratified</i>	- composed of alternating successions of different soil types, e.g. silt and sand
<i>Layer</i>	- > 75 mm in thickness
<i>Seam</i>	- 2 mm to 75 mm in thickness
<i>Parting</i>	- < 2 mm in thickness

Terminology describing soil types:

The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488). The classification excludes particles larger than 76 mm (3 inches). The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

<i>Trace, or occasional</i>	Less than 10%
<i>Some</i>	10-20%
<i>Frequent</i>	> 20%

Terminology describing compactness of cohesionless soils:

The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test N-Value (also known as N-Index). A relationship between compactness condition and N-Value is shown in the following table.

Compactness Condition	SPT N-Value
<i>Very Loose</i>	<4
<i>Loose</i>	4-10
<i>Compact</i>	10-30
<i>Dense</i>	30-50
<i>Very Dense</i>	>50

Terminology describing consistency of cohesive soils:

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests.

Consistency	Undrained Shear Strength	
	kips/sq.ft.	kPa
<i>Very Soft</i>	<0.25	<12.5
<i>Soft</i>	0.25 - 0.5	12.5 - 25
<i>Firm</i>	0.5 - 1.0	25 - 50
<i>Stiff</i>	1.0 - 2.0	50 - 100
<i>Very Stiff</i>	2.0 - 4.0	100 - 200
<i>Hard</i>	>4.0	>200



ROCK DESCRIPTION

Terminology describing rock quality:

RQD	Rock Mass Quality
0-25	<i>Very Poor</i>
25-50	<i>Poor</i>
50-75	<i>Fair</i>
75-90	<i>Good</i>
90-100	<i>Excellent</i>

Rock quality classification is based on a modified core recovery percentage (RQD) in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. RQD was originally intended to be done on NW core; however, it can be used on different core sizes if the bulk of the fractures caused by drilling stresses are easily distinguishable from *in situ* fractures. The terminology describing rock mass quality based on RQD is subjective and is underlain by the presumption that sound strong rock is of higher engineering value than fractured weak rock.

Terminology describing rock mass:

Spacing (mm)	Joint Classification	Bedding, Laminations, Bands
> 6000	<i>Extremely Wide</i>	-
2000-6000	<i>Very Wide</i>	<i>Very Thick</i>
600-2000	<i>Wide</i>	<i>Thick</i>
200-600	<i>Moderate</i>	<i>Medium</i>
60-200	<i>Close</i>	<i>Thin</i>
20-60	<i>Very Close</i>	<i>Very Thin</i>
<20	<i>Extremely Close</i>	<i>Laminated</i>
<6	-	<i>Thinly Laminated</i>

Terminology describing rock strength:

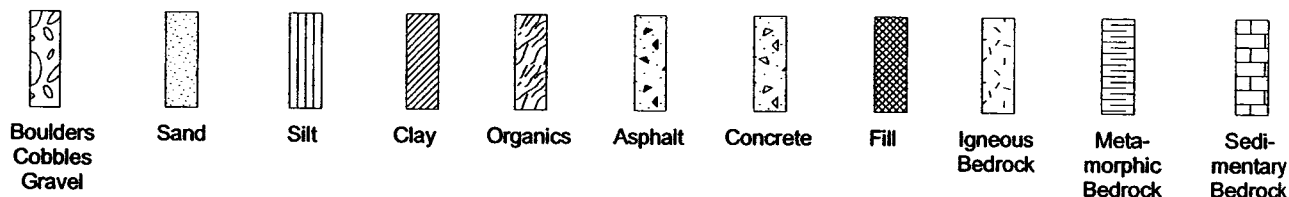
Strength Classification	Unconfined Compressive Strength (MPa)
<i>Extremely Weak</i>	< 1
<i>Very Weak</i>	1 – 5
<i>Weak</i>	5 – 25
<i>Medium Strong</i>	25 – 50
<i>Strong</i>	50 – 100
<i>Very Strong</i>	100 – 250
<i>Extremely Strong</i>	> 250

Terminology describing rock weathering:

Term	Description
<i>Fresh</i>	No visible signs of rock weathering. Slight discolouration along major discontinuities
<i>Slightly Weathered</i>	Discolouration indicates weathering of rock on discontinuity surfaces. All the rock material may be discoloured.
<i>Moderately Weathered</i>	Less than half the rock is decomposed and/or disintegrated into soil.
<i>Highly Weathered</i>	More than half the rock is decomposed and/or disintegrated into soil.
<i>Completely Weathered</i>	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.



SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
PS	Piston sample
BS	Bulk sample
WS	Wash sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond coring bits.

WATER LEVEL MEASUREMENT



RECOVERY

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

N-VALUE / RQD

Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil. For split spoon samples where insufficient penetration was achieved and N-values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N value corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log. RQD is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery.

DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to A size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (305 mm) into the soil. The DCPT is used as a probe to assess soil variability. Soil type may be inferred from adjacent boreholes and test pits.

OTHER TESTS

S	Sieve analysis
H	Hydrometer analysis
k	Laboratory permeability
γ	Unit weight
G_s	Specific gravity of soil particles
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct Shear
C	Consolidation
Q_u	Unconfined compression
I_p	Point Load Index (I_p on Borehole Record equals $I_p(50)$ in which the index is corrected to a reference diameter of 50 mm)

	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer



RECORD OF BOREHOLE No BH05-01

1 OF 1

METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 1, Station 14+720, O/S: 26 m RT CL ORIGINATED BY EH
DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / Split Spoons / Cased COMPILED BY JP
DATUM GEODETIC DATE 01.09.05 - 01.09.05 CHECKED BY BF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED	× FIELD VANE	● QUICK TRIAXIAL	× LAB VANE	○ UNCONFINED						× FIELD VANE	● QUICK TRIAXIAL	× LAB VANE
197.8	Highway 7, Toe of Slope							20	40	60	80	100	10	20	30					
199.9	TOPSOIL																			
0.1	SAND, some grass and roots (FILL)		1	SS	1															
197.2																				
0.6	SILTY SAND with gravel, occasional cobbles, compact, brown to dark brown, very wet (SM)		2	SS	13		197													
			3	SS	13															
196.0																				
1.8	SAND with silt and gravel, well graded, very dense, dark brown (GLACIAL TILL) (SW-SM)		4	SS	150		196									15 72 (12)				
195.8																				
2.0	Split Spoon Refusal on Inferred Bedrock																			

MTO 11802 MTO.GPJ ON MOT.GDT 23/03/06

RECORD OF BOREHOLE No BH05-02

1 OF 1

METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 1, Station 14+770, O/S: 23 m RT CL ORIGINATED BY EH
DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / SplitSpoons / Cased COMPILED BY JD
DATUM GEODETIC DATE 01.09.05 - 01.09.05 CHECKED BY BF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)
								○ UNCONFINED	× FIELD VANE	● QUICK TRIAXIAL	× LAB VANE							
198.6	Highway 7, Toe of Slope						20	40	60	80	100							
198.6 0.1	TOPSOIL, some sand, trace roots, trace gravel, loose, dark brown SAND, trace silt, trace organic matter, organic odour, loose, dark brown to grey, wet (FILL) (SP-SM)		1	SS	2													
			2	SS	1													
197.2	Split Spoon Refusal on Inferred Bedrock		3	SS	177 130 mm													
1.4	Standpipe Installed																	

MTO 11802 MTO.GPJ ON MOT.GDT 2303/06

RECORD OF BOREHOLE No BH05-03

1 OF 1

METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 1, Station 14+770, O/S: 28 m RT CL ORIGINATED BY EH
DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / Split Spoons / Cased COMPILED BY JD
DATUM GEODETIC DATE 01.09.05 - 01.09.05 CHECKED BY BF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED	× FIELD VANE	● QUICK TRIAXIAL	× LAB VANE	20						40	60	80
198.6	Highway 7, 5 m Beyond Toe of Slope																			
198.6 0.1	TOPSOIL SAND, with silt and gravel, trace organic, loose, brown to dark brown, moist to very wet (FILL) (SP-SM)		1	SS	4		198													
			2	SS	2															
197.2																				
197.2 1.4	Peat, wood chips, very wet, very soft SAND, with silt and gravel, trace organic, loose, brown to dark brown, moist to very wet (FILL) (SP-SM)		3	SS	5		197													
196.2																				
196.2 2.4	SILTY SAND with gravel, occasional cobbles, loose, wet (SM) Becoming clayey		4	SS	8		196									16 54 27 3				
195.5																				
195.5 3.1	SAND with silt, well graded, occasional cobbles, compact, moist to wet (GLACIAL TILL) (SW-SM)		5	SS	19		195									3 89 (8)				
			6	SS	31															
			7	SS	25		194													
193.4																				
193.4 5.2	Borehole Terminated at 5.18 m Standpipe Installed																			

MTD 11802 MTD.GPJ ON MOT.GDT 23/03/06

RECORD OF BOREHOLE No BH05-04

1 OF 1

METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 1, Station 14+820, O/S: 22 m RT CL
DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / Split Spoons / Cased
DATUM GEODETIC DATE 01.09.05 - 01.09.05

ORIGINATED BY EH
COMPILED BY JD
CHECKED BY BF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED	× FIELD VANE	● QUICK TRIAXIAL	× LAB VANE	WATER CONTENT (%)					
							20	40	60	80	100						
202.4	Highway 7, Toe of Slope																
200.9	TOPSOIL																
0.1	SAND, with silt and gravel, trace organic, dark brown, moist (FILL) (SP-SM)		1	SS	4												
			2	SS	8												
200.9																	
1.5	Auger Refusal on Inferred Bedrock																


MTD 11802 MTO.GPJ ON MOT.GDT 23/03/08

RECORD OF BOREHOLE No BH05-05

1 OF 1

METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 3, Station 15+380, O/S: 16 m RT CL ORIGINATED BY **ZH**
 DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / Split Spoons / Cased COMPILED BY **JD**
 DATUM GEODETIC DATE 02.09.05 - 02.09.05 CHECKED BY **BF**

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										
								20 40 60 80 100										
								○ UNCONFINED × FIELD VANE ● QUICK TRIAXIAL × LAB VANE										
							20 40 60 80 100					WATER CONTENT (%)			kN/m ³	GR SA SI C		
216.2	Highway 7, Toe of Slope						216								0 92 (8)			
218.9	TOPSOIL																	
0.1	SAND, with silt, moist, brown (SP-SM)		1	SS	5													
			2	SS	8													
215.0									215									
1.2	SAND, well graded, compact to dense, moist to wet, brown (SW)		3	SS	14													
	some silt		4	SS	31													
			5	SS	24													
		6	SS	20		213												
		7	SS	34														
		8	SS	21		212												
211.4	End of Borehole																	
4.9																		

MTD 11802 MTD.GPJ ON MOT.GDT 24/03/06

RECORD OF BOREHOLE No BH05-06

1 OF 1

METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 3, Station 15+350, O/S: 18 m RT CL ORIGINATED BY EH
DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / SplitSpoons / Cased COMPILED BY JD
DATUM GEODETIC DATE 02.09.05 - 06.09.05 CHECKED BY BF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)		
								○ UNCONFINED × FIELD VANE		● QUICK TRIAXIAL × LAB VANE									
214.7	Highway 7, Toe of Slope						20	40	60	80	100	10	20	30					
214.0	TOPSOIL						20	40	60	80	100								
0.1	GRAVEL with silt and sand, brown, moist (FILL) (GP)		1	SS	3										32 28 (40)				
			2	SS	4														
213.5			3	SS	12														
1.2	SAND with gravel, poorly graded, trace silty clay seams, loose to dense, brown to mottled brown, moist to wet: FILL (SP-SM)		4	SS	10										41 53 (6)				
			5	SS	7														
			6	SS	7														
			7	SS	41										35 60 (5)				
			8	SS	20														
209.5	End of Borehole																		
5.2	Standpipe Installed																		

MTO 11802 MTO.GPJ ON MOT.GDT 23/03/06

RECORD OF BOREHOLE No BH05-07

1 OF 1

METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 3, Station 15+350, O/S: 23 m RT CL ORIGINATED BY EH
DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / Split Spoons / Cased COMPILED BY JD
DATUM GEODETIC DATE 06.09.05 - 06.09.05 CHECKED BY BF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)
								○ UNCONFINED	× FIELD VANE	● QUICK TRIAXIAL	× LAB VANE							
214.9	Highway 7, 5m beyond Toe of Slope							20	40	60	80	100						
214.0	TOPSOIL																	
0.1	SILTY SAND, occasional trace organic matter, occasional peat seams, loose, brown, wet (FILL) (SM)		1	SS	2													
			2	SS	3		214											
213.7																		
1.2	SILTY SAND, loose, brown, wet (SM)		3	SS	6													
			4	SS	7		213											
			5	SS	5													
			6	SS	5		212											
			7	SS	4													
			8	SS	9		211											
210.0																		
4.9	End of Borehole																	


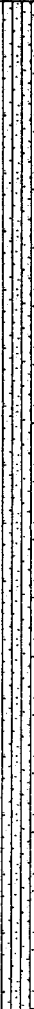
MTO 11802 MTO.GPJ ON MOT.GDT 23.03/06

RECORD OF BOREHOLE No BH05-08

1 OF 1

METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 3, Station 15+320, O/S: 24 m RT CL ORIGINATED BY EH
 DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / Split Spoons / Cased COMPILED BY JD
 DATUM GEODETIC DATE 06.09.05 - 07.09.05 CHECKED BY BF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)
								○ UNCONFINED	× FIELD VANE	● QUICK TRIAXIAL	× LAB VANE							
213.5	Highway 7, Toe of Slope						20	40	60	80	100							
213.4	TOPSOIL	P ₂					20	40	60	80	100							
0.1	SANDY SILT, grey, wet (FILL) (ML)		1	SS	1													
			2	SS	5													
212.3																12 23 (65)		
1.2	SILTY SAND, compact to very loose, wet, brown (SM)		3	SS	14											0 56 44 0		
			4	SS	16													
	No Recovery		5	SS	1													
			6	SS	1													
	No Recovery		7	SS	1													
	No Recovery																	
208.3	End of Borehole																	
5.2																		

MTO 11802 MTO.GPJ ON MOT.GDT 23/03/06

RECORD OF BOREHOLE No BH05-09A

1 OF 1

METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 4, Station 16+925, O/S: 12 m LT CL ORIGINATED BY EH
 DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / Split Spoons / Cased COMPILED BY JD
 DATUM GEODETIC DATE 20.09.05 - 20.09.05 CHECKED BY BF

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
						20	40	60	80	100						
210.2	Highway 7, Toe of Slope															
210.0	TOPSOIL															
0.1	SILTY SAND, trace organic matter, moist, brown to dark brown (FILL) (SM)		1	SS	1											
209.2			2	SS	33/ 75 mm											
1.0	Split Spoon Refusal on Inferred Bedrock															


MTO 11802 MTO.GPJ ON MOT.GDT 23/03/06

RECORD OF BOREHOLE No BH05-10A

1 OF 1

METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 4, Station 16+925, O/S: 17 m LT CL ORIGINATED BY EH
 DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / Split Spoons / Cased COMPILED BY JD
 DATUM GEODETIC DATE 20.09.05 - 20.09.05 CHECKED BY BF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa														
210.5	Highway 7, 5 m beyond Toe of Slope		1	SS	33/ 150 mm		210	20 40 60 80 100					20 40 60 80 100					10 20 30				
210.4	TOPSOIL							○ UNCONFINED × FIELD VANE					○ UNCONFINED × FIELD VANE					○ UNCONFINED × FIELD VANE				
0.1	SILTY SAND, some organics, dark brown, moist (FILL) (SM)							● QUICK TRIAXIAL × LAB VANE					● QUICK TRIAXIAL × LAB VANE					● QUICK TRIAXIAL × LAB VANE				
209.8	Split Spoon Refusal on Inferred Bedrock							20 40 60 80 100					10 20 30									
0.6								20 40 60 80 100					10 20 30									

MTO 11802 MTO.GPJ ON MOT.GDT 23/03/06

RECORD OF BOREHOLE No BH05-11

1 OF 1

METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 5, Station 17+375, O/S: 15.5 m LT CL
DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / Split Spoons / Cased
DATUM GEODETIC DATE 07.09.05 - 07.09.05

ORIGINATED BY EH
COMPILED BY JD
CHECKED BY BF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)
								○ UNCONFINED		× FIELD VANE		● QUICK TRIAXIAL						
197.4	Highway 7, Toe of Slope						20	40	60	80	100	10	20	30	kN/m ³	GR SA SI CL		
0.0	PEAT, partially decomposed, organic odour, highly compressible, fibrous, very soft, black, wet		1	SS	1	197												
196.9	SANDY SILT (ML) TO SILTY SAND (SM), very loose, brown, wet		2	SS	3													
0.5			3	SS	1		196											
			4	SS	33/ 125 mm													
195.1			- some gravel															
2.3	Spoon Refusal on Inferred Bedrock																	

RECORD OF BOREHOLE No BH05-12

1 OF 1

METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 5, Station 17+375, O/S: 20.5 m LT CL ORIGINATED BY EH
 DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / Split Spoons / Cased COMPILED BY JD
 DATUM GEODETIC DATE 07.09.05 - 07.09.05 CHECKED BY BF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
197.3	Highway 7, 5 m beyond Toe of Slope						20	40	60	80	100									
0.0	PEAT, partially decomposed, fibrous, mixed with some sand and silt, organic odour, highly compressible, very soft / loose, black, wet																			
197.0																				
0.3	SANDY SILT, clay seams, loose, brown, wet (ML)		1	SS	1		197													
			2	SS	1											0 37 56 7				
			3	SS	2		196													
195.2			4	SS	4											13 59 (28)				
2.2	Gravelly to silty Sand (SM)		5	SS	33/ 100 mm		195													
194.5																				
2.8	Split Spoon Refusal on Inferred Bedrock Standpipe Installed																			

RECORD OF BOREHOLE No BH05-13

1 OF 1

METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 2, Station 15+035, O/S: 28 m RT CL ORIGINATED BY EH
DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / Split Spoons / Cased COMPILED BY JD
DATUM GEODETIC DATE 21.09.05 - 21.09.05 CHECKED BY BF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								20 40 60 80 100										10 20 30		
208.1	Highway 7, 5 m beyond Toe of Slope																			
0.0	Standing Water						208													
207.1																				
1.0	Probable Peat (no recovery)						207													
206.1																				
1.9	SILTY SAND with gravel, very loose, brown, wet (SM)		1	SS	1		206													
205.6																				
2.5	SAND with silt and gravel, well graded, dense, wet (GLACIAL TILL) (SW-SM)		2	SS	13		205													
			3	SS	33/ 70 mm															
204.7	Split Spoon Refusal on Inferred Bedrock																			
3.4																				

MT0 11802 MTO.GPJ ON MOT.GDT 23/03/06

RECORD OF BOREHOLE No BH05-14

1 OF 1

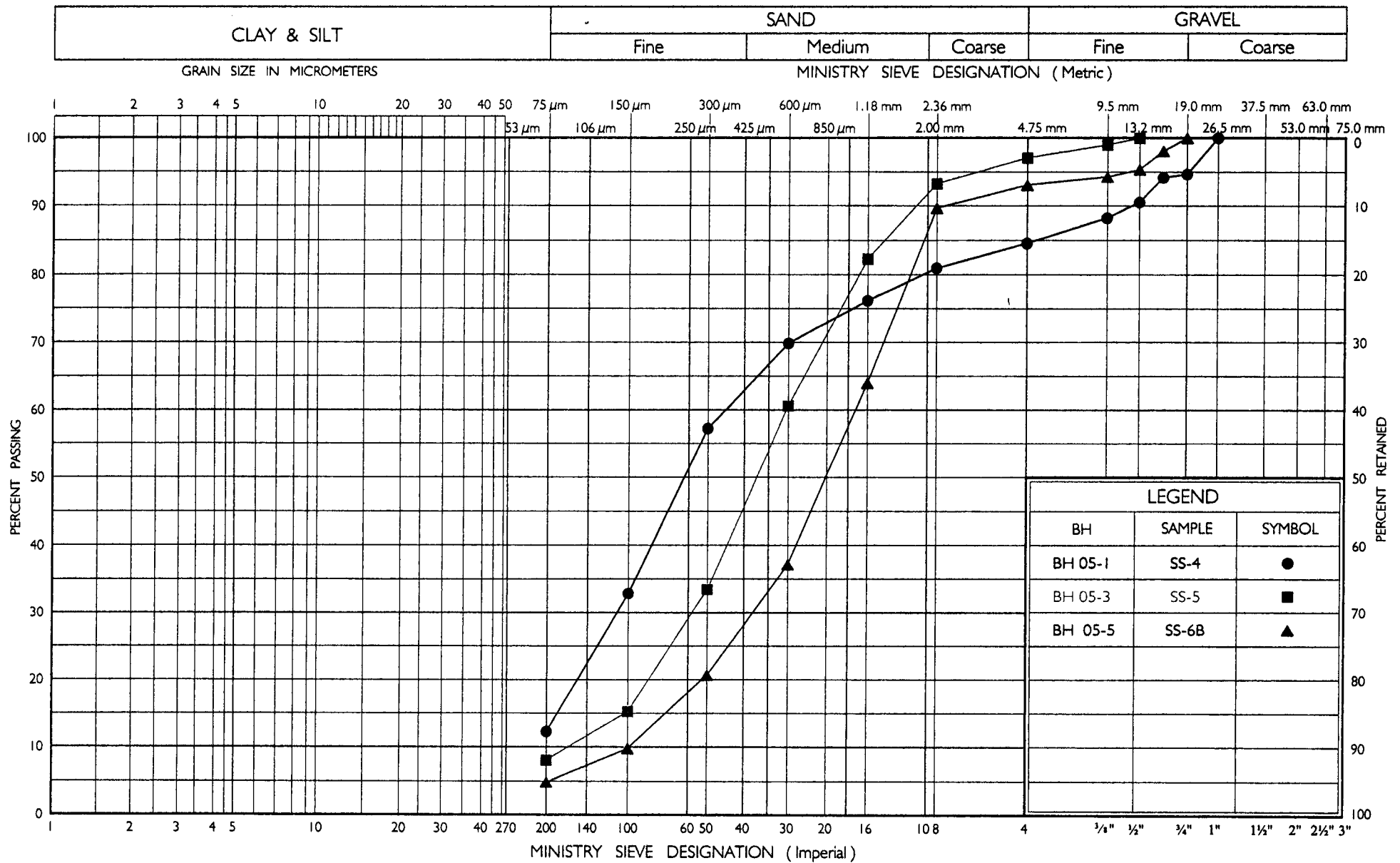
METRIC

W.P. 129-80-00 LOCATION Proposed Embankment, Area 2, Station 15+035, O/S: 23 m RT CL ORIGINATED BY EH
 DIST BANCROFT HWY NO. 7 BOREHOLE TYPE Solid Stem Augers / Split Spoons / Cased COMPILED BY JD
 DATUM GEODETIC DATE 21.09.05 - 21.09.05 CHECKED BY BF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
208.1 0.0	Highway 7, Toe of Slope Standing Water						208							
207.2 0.9	PEAT, some silt, very soft, highly compressible, very wet, black		1	SS	1		207							
206.2 1.9	SILTY SAND, loose to compact, brown to grey, wet to very wet (SM)		2	SS	1		206							
	Becoming clayey		3	SS	2		205							3 67 (30)
			4	SS	13									
204.3 3.7	Auger Refusal on Inferred Bedrock													

MTD 11802.MTD.GPJ ON MOT.GDT 23/03/06

UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION
SAND WITH SILT

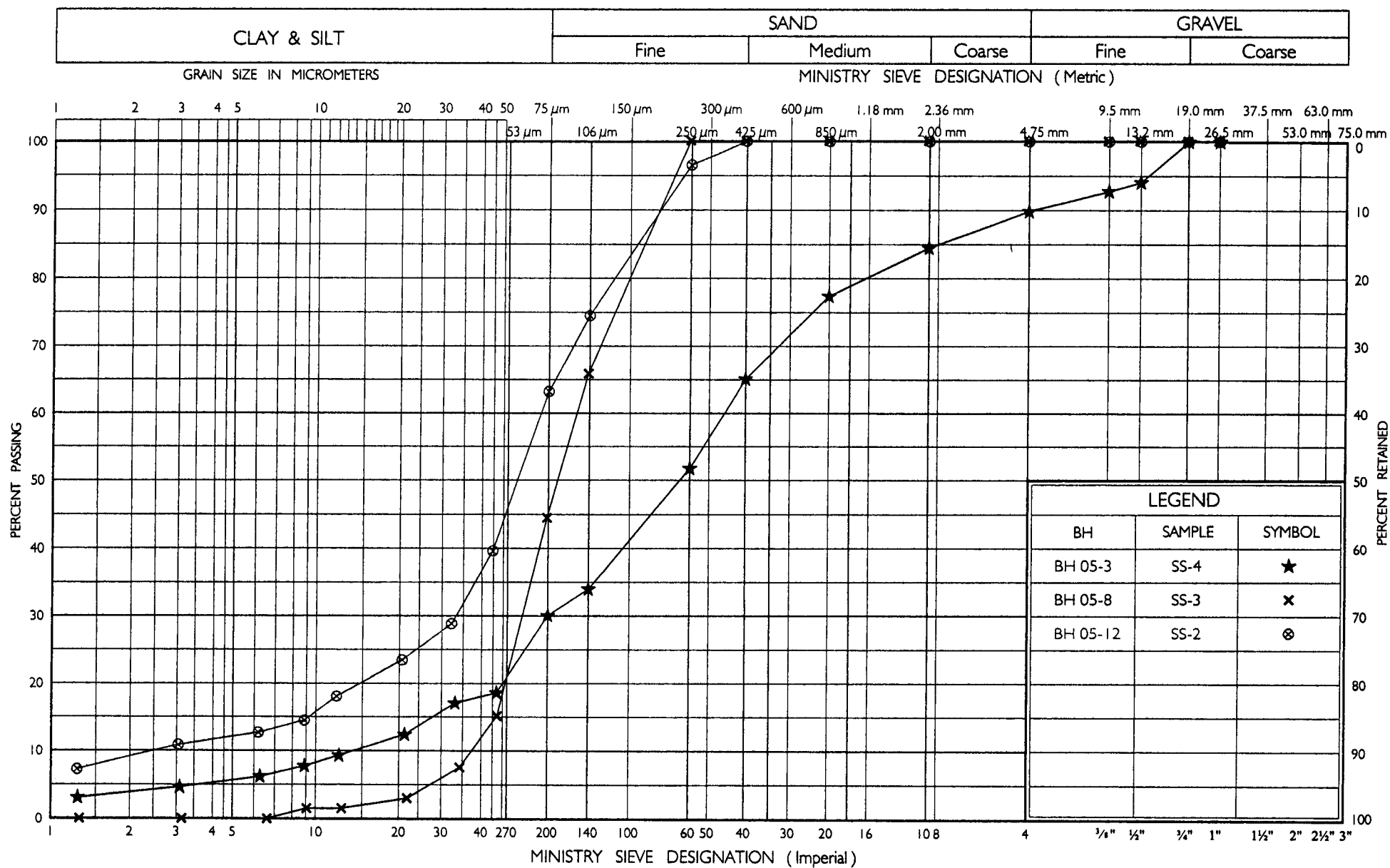
FIG No 1

G W P 129-80-00



Ministry of
Transportation
Ontario

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation
Ontario

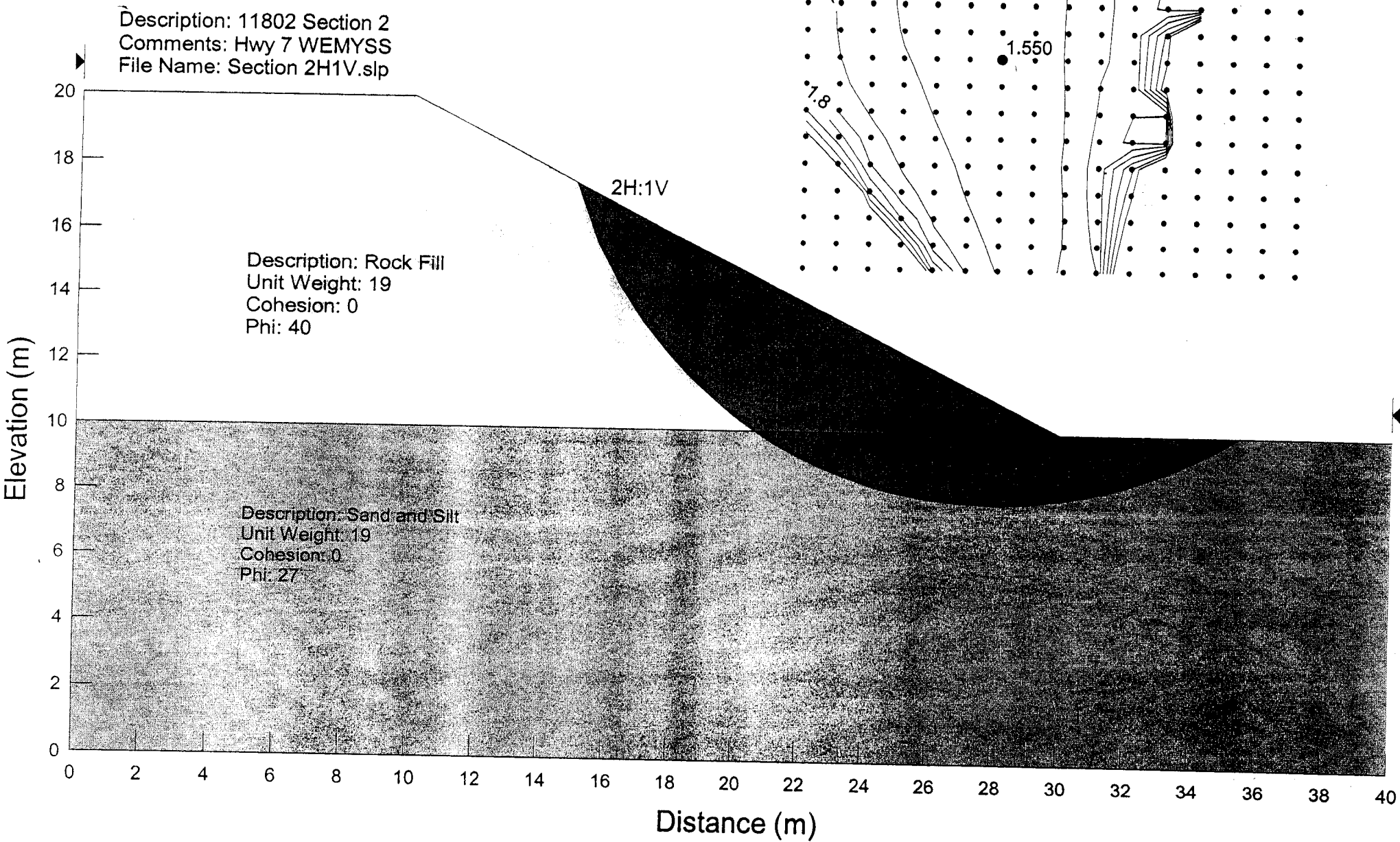
GRAIN SIZE DISTRIBUTION
SILTY SAND TO SANDY SILT

FIG No 2

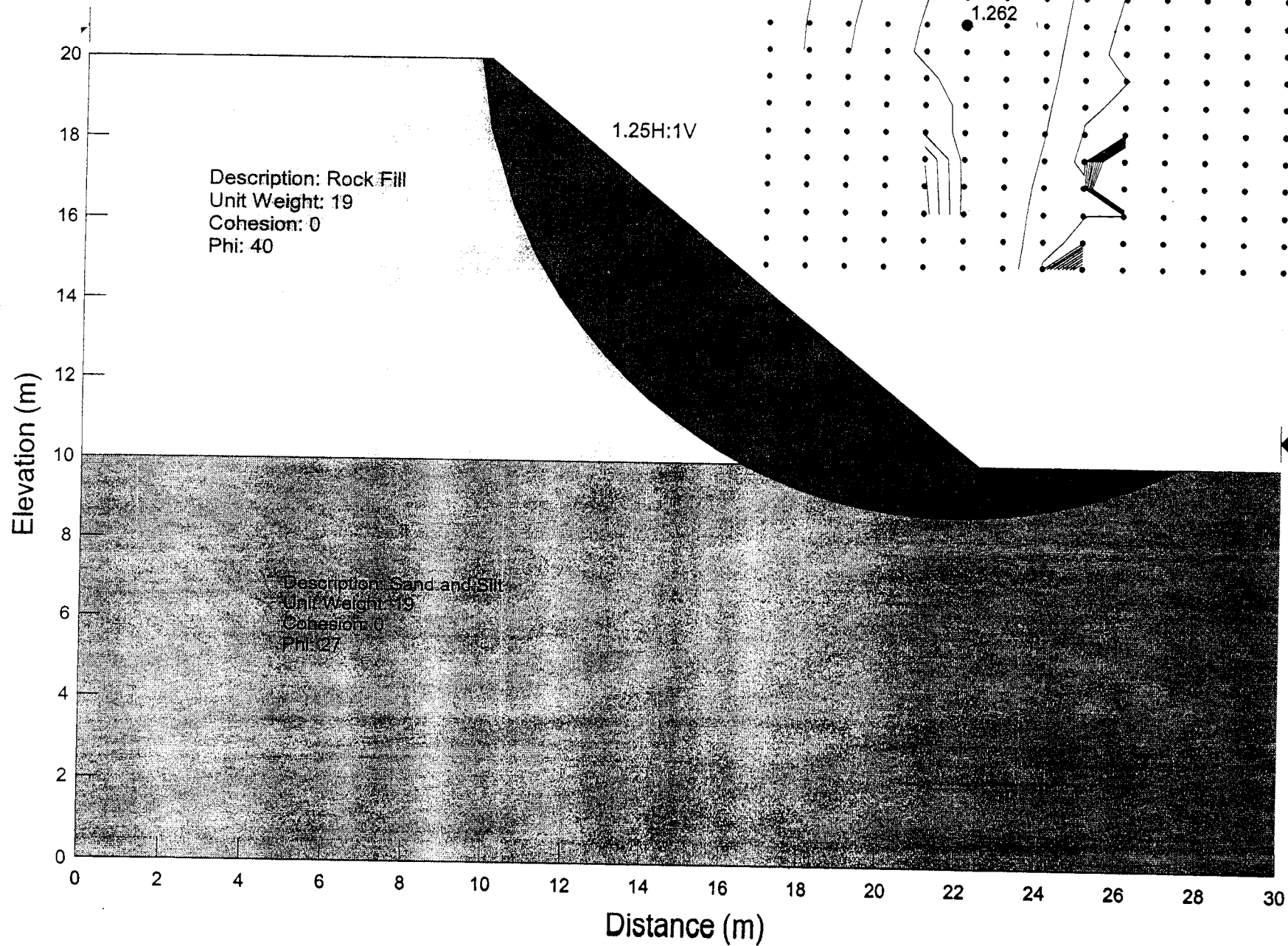
G W P 129-80-00

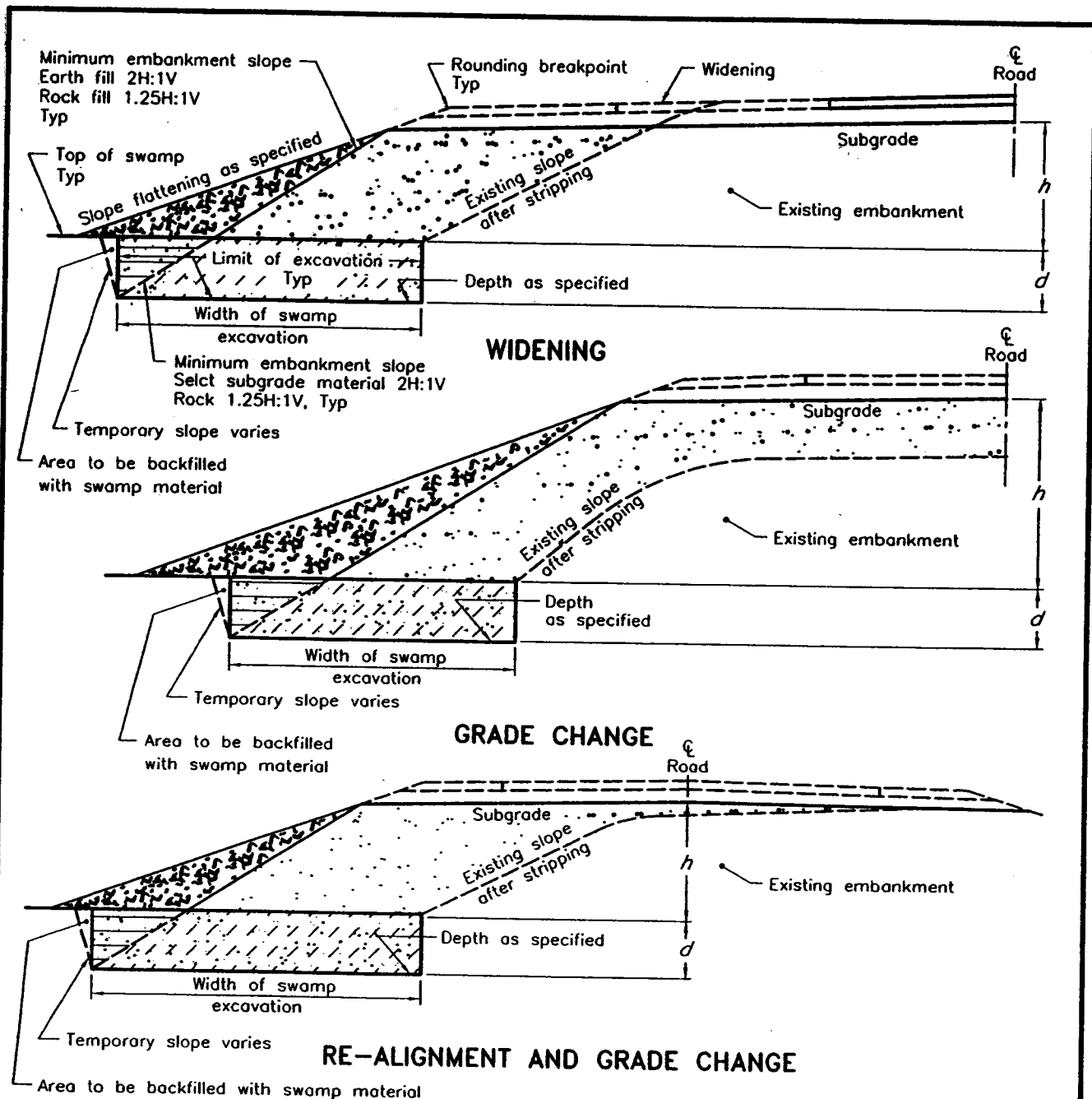
APPENDIX C

Slope/W Stability Analysis Results



Description: 11802 Section 1
Comments: Hwy 7 WEMYSS
File Name: Section 1.25H1V.slp





NOTES:

- For this OPSD, h must be $\leq 4.5\text{m}$ and d must be $\leq 6.0\text{m}$.
- Topsoil shall be stripped from existing slopes.
- Height of fill is the vertical difference between top of subgrade and top of swamp elevation measured at new road centreline.
- Widening of existing earth embankments shall be benched according to OPSD-208.010.
- All dimensions are in millimetres unless otherwise shown.

LEGEND:

- h - Height of fill
 d - Depth of sub-excavation
- Embankment materials as specified
 - Excavated swamp material
 - Excavate and backfill as specified
 - Excavate and backfill with swamp material

ONTARIO PROVINCIAL STANDARD DRAWING

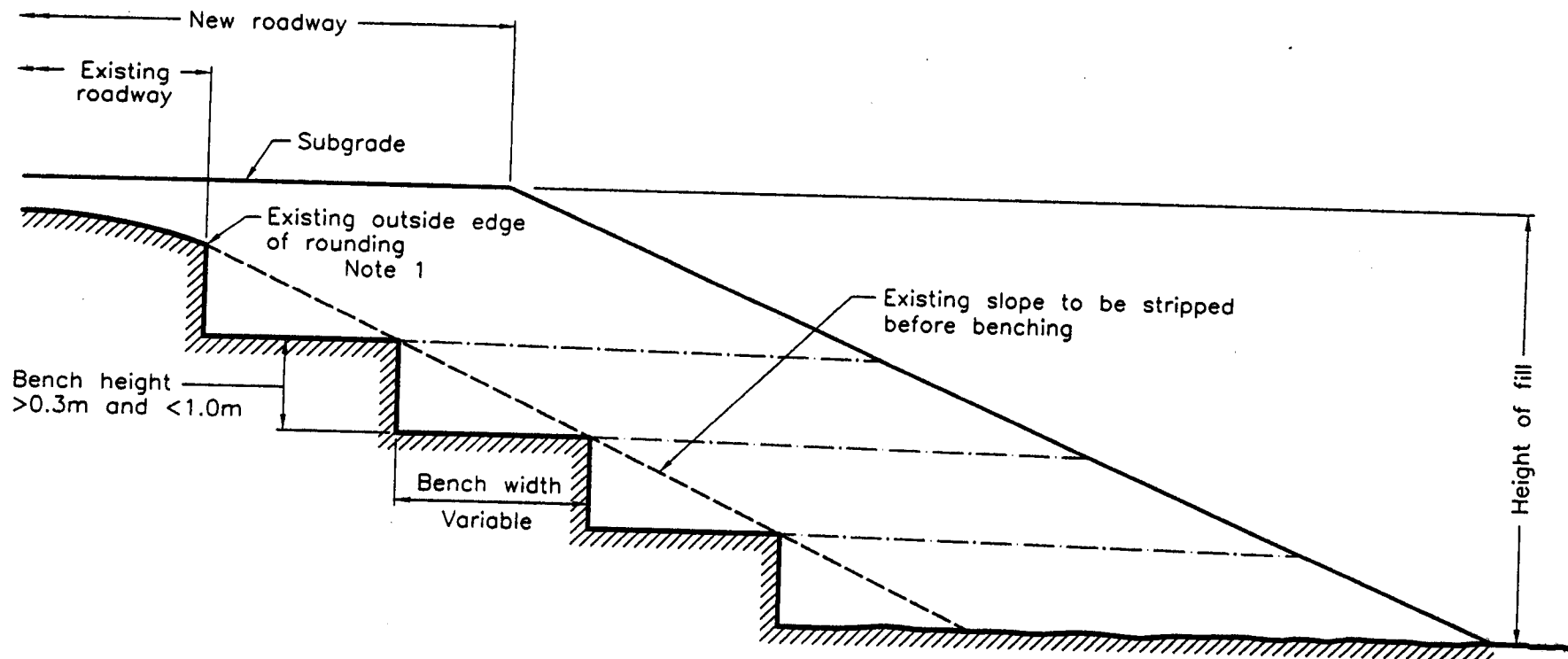
Nov 2005 Rev 2

EMBANKMENTS OVER SWAMP

EXISTING SLOPES MAINTAINED



OPSD - 203.030



NOTES:

- 1 When the subgrade is below the existing outside edge of rounding, benching shall be carried out below the point where the subgrade intersects the existing slope.
- A Benching is not required on existing slopes flatter than 3H:1V.

- B Benches are to be excavated one level at a time and the compacted fill brought up before the next benching level is excavated.

ONTARIO PROVINCIAL STANDARD DRAWING

BENCHING OF EARTH SLOPES

Nov 2003 Rev 1



OPSD - 208.010



Sangiuliano, Tony (MTO)

From: Sangiuliano, Tony (MTO)
Sent: February 1, 2007 2:47 PM
To: Horba, Ed (MTO)
Subject: RE: Hwy 7 Sharbot Lake to Wemyss (wp 129-80-00) Extra Work

Ed:

We have completed our review of the revised scope of work for the Foundations Engineering component. The revised scope addresses our comments contained in our previous review and submitted in our email dated December 22, 2007. The scope of work and fee for the Foundations component is considered reasonable and we recommend approval.

Tony

-----Original Message-----

From: Horba, Ed (MTO)
Sent: February 1, 2007 2:28 PM
To: Westendorp, Sharon (MTO); Filson, Todd (MTO); Sangiuliano, Tony (MTO); Wang, Jerry (MTO)
Cc: Pawliuk, Phil (MTO)
Subject: Hwy 7 Sharbot Lake to Wemyss (wp 129-80-00) Extra Work

All
Please find attached MH's revised scope of work for the Rudsdale Creek structure replacement. It appears that they have not included a MOE permit to take water, as we had previously requested. Please provide any other comments next week.
Thanks Ed

-----Original Message-----

From: Lincoln MacDonald [mailto:LMacDonald@morrissonhershfield.com]
Sent: January 31, 2007 11:26 AM
To: Horba, Ed (MTO)
Subject: Hwy 7 Sharbot Lake to Wemyss (wp129-80-00)

Hi Ed,

Please find attached the revised Scope Change for Rudsdale Creek Culvert, I apologize for the delay I was waiting for revised submissions from Jacques Whitford and MacViro. I have tried to address all of the issues from your e-mail. Please review and provide any comments. A hard copy is being sent by mail.

On another note, are there are comments on the Drainage & Hydrology Report submitted at the 60% Progress Meeting in November 2006? We would

like to finalize the report and submit.

regards,
Lincoln

E-mail From:
Lincoln S. MacDonald, P. Eng.
Associate
Senior Project Manager
Morrison Hershfield Limited
2440 Don Reid Drive,
Ottawa, Ontario, K1H 1E1
Phone: (613) 739-2910, Ext. 2261, Fax: (613) 739-4926
E-mail: lmacdonald@morrisonhershfield.com,
Visit our Website at: www.morrisonhershfield.com

Sangiuliano, Tony (MTO)

From: Horba, Ed (MTO)
Sent: December 20, 2006 3:07 PM
To: Sangiuliano, Tony (MTO)
Cc: Filson, Todd (MTO)
Subject: Hwy 7 Sharbot Lake WP 129-80-00 - Rudsdale Creek Culvert Replacement



Rudsdale Creek
Culvert Plan Vi...



Rudsdale Creek
Highway Cross-s...



Rudsdale Creek
Highway Cross-s...



LSM.EH.MTO -
Rudsdale Creek Cu...

Hi Tony

We have recently identified the need to replace the Rudsdale creek structure and have received a scope of work and cost estimate from the consultant. I would appreciate your review and comments on the Foundations component and costs. Also attached are typical sections and plan view of the culvert.

The intent is to replace the culvert at the same location as existing, with possible extensions to the north and south to accommodate detour requirements. Extensions would be a maximum of 2 metres on both sides. Our preference would be to replace with a box culvert of similar size (5.5 x 1.8), however availability and environmental issues may determine that an open footing is preferable, (our consultant would review options and suggest preferences). Not sure if it matters to foundations if we use open footing or box culvert.

Thanks Ed

-----Original Message-----

From: Lincoln MacDonald [mailto:LMacDonald@morrisonhershfield.com]
Sent: December 20, 2006 2:00 PM
To: Horba, Ed (MTO)
Subject: RE: Hwy 7 Sharbot Lake WP 129-80-00 - Rudsdale Creek CulvertReplacement

Hi Ed,

Please find attached a plan view of the culvert and cross-sections at the culvert. I have sent both autocad and pdf for the cross-sections.

regards,
Lincoln

E-mail From:
Lincoln S. MacDonald, P. Eng.
Associate
Senior Project Manager
Morrison Hershfield Limited
2440 Don Reid Drive,
Ottawa, Ontario, K1H 1E1
Phone: (613) 739-2910, Ext. 2261, Fax: (613) 739-4926
E-mail: lmacdonald@morrisonhershfield.com,

Visit our Website at: www.morrisonhershfield.com

>>> "Horba, Ed (MTO)" <Ed.Horba@ontario.ca> 12/19/2006 11:01 AM >>>
Hi Lincoln

As per below email can you please forward cross section info at the creek. Please also send the plan view. Once received I will forward to Tony with text of your original email for Foundations to comment. I believe Tony is in the office until Friday, hence we may be able to get his comments by weeks end if we get dwgs and sections.
Thanks Ed

-----Original Message-----

From: Horba, Ed (MTO)
Sent: December 14, 2006 9:46 AM
To: 'Lincoln MacDonald'
Subject: RE: Hwy 7 Sharbot Lake WP 129-80-00 - Rudsdale Creek CulvertReplacement

Lincoln

There will be additional comments, hopefully by early next week. Regarding Paragraph 3, there must be a credit for work not yet completed in the original assignment under Bridge Engineering. The original design effort for the structure rehab would have included some of the items in your quote, hence there will be items that are no longer required under the original bridge engineering terms of reference.

Can you also please forward a couple of existing cross sections at the culvert to Todd Filson so that he can review geotech requirements.

Please call to discuss invoicing issues.

Thanks Ed

-----Original Message-----

From: Lincoln MacDonald [mailto:LMacDonald@morrisonhershfield.com]
Sent: December 12, 2006 5:11 PM
To: Horba, Ed (MTO)
Subject: RE: Hwy 7 Sharbot Lake WP 129-80-00 - Rudsdale Creek CulvertReplacement

Hi Ed,

I have reviewed your e-mail below and offer the following:

Paragraph 1

I will revise the schedule component of the letter based upon the information you have provided below, assuming approval / direction to proceed received by the end of January 2007. This will result in the Technical Review meeting being delayed further.

Paragraph 2

Work will continue on the rest of the design while the culvert design is ongoing, for those items not impacted by the culvert design. Though not mentioned in the letter that was the intent and I will include a statement as such.

Paragraph 3

I am not aware of a MH commitment to a credit for the structure work;

I

believe there would be a credit offered if there was no work on the culvert at all. However, as the culvert is being replaced our estimate

/ quotation is only for the additional design effort required to complete the structure work assuming the remaining funds for the structure design will be utilized as well. As such there is no credit to be offered. With respect to Navigable waters, I will discuss with our structures group to determine if the quotation will be impacted.

I

will let you know if a revision is required.

Paragraph 4

I indicated within the spreadsheet that a review of culvert options would be undertaken but Environmental was fairly firm on the desire for

an open bottom. As well, a box culvert design would like result in a double cell design as the largest span of a pre-cast box culvert is approximately 3.0m while the existing span is 5.5m. There may be additional hydraulic analysis required to evaluate twin cell box culverts; I will let you know if additional costs are associated with the consideration of box culverts.

Paragraph 5

If an extension is required can only be fully determined after looking at the detours and the cross-sections. Based upon a simple plan view review it appears that the detours can be done without extensions but it

is very close. Cross-sections will help to determine if side slope impacts will necessitate extensions. I stated 2m extensions because I believe that would be the maximum extension and the aim would be for none. I can reword this section.

Paragraph 6

I am aware that contingency funds must need approval from MTO prior to being utilized. I was only stating that if Temporary Illumination is required, there is already a contingency for this that can be utilized rather than developing a new quotation as part of this submission.

Paragraph 7

As previously communicated by Stan McGillis, the 10% mark-up on sub

consultants covers MH costs associated with the Administration / Project Management / Quality Control of our sub-consultants and their deliverables. As previously discussed, we are awaiting a MTO decision on this matter.

I trust the above addresses the issues / concerns you raised; please feel free to contact me to discuss anything else.

On another issue, are you processing a Contract Memorandum with respect to the Vertical Grade Revisions which you have approved and issued payment under or is it your intent to redirect funds from a contingency to it. I need to get our accounting in place for our year end audit.

regards,
Lincoln

E-mail From:
Lincoln S. MacDonald, P. Eng.
Associate
Senior Project Manager
Morrison Hershfield Limited
2440 Don Reid Drive,
Ottawa, Ontario, K1H 1E1
Phone: (613) 739-2910, Ext. 2261, Fax: (613) 739-4926
E-mail: lmacdonald@morrisonhershfield.com,
Visit our Website at: www.morrisonhershfield.com

>>> "Horba, Ed (MTO)" <Ed.Horba@ontario.ca> 12/12/2006 3:28 PM >>>
Hi Lincoln

Not sure how MH expects MTO approval in early January. Internal reviews will take about one week, mini meeting would then be scheduled for early January and at least four weeks for Queens Park to sign off on the extra work. This also does not account for any discussions/clarifications between MH and MTO. As I see it, approvals would not be given until at least the end of January 2007, possibly the end of February. As such please review and revise your schedule component of the extra work letter.

With respect to the project schedule it is my expectation that there will be no delay to items that are not associated with the culvert replacement, I.e. property request, finalizing HDS and plans not associated with culvert replacement, and that work on other items such as the 90% package etc, will continue with the exception of the details that need to be incorporated because of the culvert.

MH had previously noted there would be a credit for work no longer

required as part of the original structure design, this has not been included in the cost estimate. Navigable waters has not been addressed and should be included.

Review of culvert type should not be limited to open footing culvert.

A box culvert will shorten the duration of work and eliminate concrete pours adjacent to the water course. Box culverts have been excepted by MNR if we can show that the water level is permanently well above the bottom of the culvert and stream velocities will not wash away any substrate that we may include in the bottom for fish passage or other reasons. I would suggest that we approach agencies with the Box design to get initial comments, which will indicate if the box will be acceptable.

In previous discussion MH also indicated that the existing culvert would likely suffice for detour requirements, but your proposal now suggests that a 2m extension would be required on both sides, what has changed?

Items included in highway design that draw on the contingency funds for

temporary signals or illumination are not to be spent unless agreed by the Ministry that the items are required because of staging or other issues. This can only be determine when we have some preliminary staging details to review and comment on.

Costs: Please advise what the 10% administration costs for sub consultants will be used for?

I will advise of other concerns when I have received a response from all other MTO sections.

Thanks Ed

-----Original Message-----

From: Lincoln MacDonald [mailto:LMacDonald@morrisonhershfield.com]

Sent: December 12, 2006 9:59 AM

To: Horba, Ed (MTO)

Subject: Hwy 7 Sharbot Lake (wp129-80-00) - Rudsdale Creek CulvertReplacement

Hi Ed,

Please find attached our scope change proposal for the Rudsdale Creek Culvert Replacement. We believe this is a fair submission of the work involved and are not in a position to cut as it impacts our ability to undertake and complete the work.

We need to have approval to proceed as quickly as possible in order for Jacques to mobilize for their investigations. Given the current shortage of drill rigs available, Jacques pre-booked one for early January but they will loose it if they do not start the first week of

January.

Please call if you have any questions.

regards,
Lincoln

E-mail From:
Lincoln S. MacDonald, P. Eng.
Associate
Senior Project Manager
Morrison Hershfield Limited
2440 Don Reid Drive,
Ottawa, Ontario, K1H 1E1
Phone: (613) 739-2910, Ext. 2261, Fax: (613) 739-4926
E-mail: lmacdonald@morrisonhershfield.com,
Visit our Website at: www.morrisonhershfield.com

MORRISON HERSHFIELD

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December 8th, 2006
Resubmitted January 31st, 2007

Mr. Ed Horba, P. Eng., Project Manager
Ministry of Transportation
Planning and Design Section
1355 John Counter Boulevard
Kingston, ON K7L 5A3

Dear Mr. Horba:

**Re: Agreement No. 4004-E-0016 - G.W.P. 129-808-00, Highway 7 Detail Design
Twp. Road 38 to Wemyss
Rudsdale Creek Culvert Replacement - Addendum**

At the November 3rd, 2006 60% Progress Meeting, MTO Planning & Design Section and MTO Structural Section requested that MH be prepared to provide a Scope Change proposal to undertake the design for the replacement of the Rudsdale Creek Culvert (Site No. 15-179); following a final review of the Addendum to the Structural Design Report. The Ministry directed MH on November 16th, 2006 to proceed with preparing the Scope Change, including all associated activities. A Scope Change was submitted on December 8th, 2006; following review by MTO comments were received on December 14th and December 22nd, 2006. MH reviewed the comments received and have revised the previous submission to address the comments. The replacement of the Rudsdale Creek Culvert is acknowledged as a Change Order to our assignment in accordance with Section 12.1 a) of the Legal Agreement as this work was not identified in the Terms of Reference for the RFP or any of the Ministry's supporting documentation.

In accordance with direction given by the MTO, MH has reviewed the requirements to undertake the additional design activities. It is understood that the existing 5500 m x 1550 m open footing culvert is to be replaced. The design activities include foundations investigations, pavement design investigations, additional environmental considerations (especially with respect to fisheries as this culvert has been identified as a fish bearing stream), hydraulic drainage design, Stage II archaeological study, structural culvert design, traffic management and staging design, highway design, etc.

SCOPE OF WORK

A review of culvert alternatives will be carried out, though it is understood that the preferred culvert replacement is an open footing concrete culvert, with no vertical or horizontal alignment changes. A hydraulic analysis will be carried out during the evaluation of alternatives phase. The culvert will likely require an extension of approximately 2 m on either side; this will be better defined once the staging requirements have been determined. All efforts will be made to maintain the existing length of the culvert. It is acknowledged, however, that construction staging may require an embankment widening of approximately 2 m on both sides of the highway for approximately 200 m from the culvert on one side and 300 m on the other side.

In absence of receiving a detailed Terms of Reference from the Ministry, we have developed our Work Plan based upon the requirements for other assignments that contained similar work. In summary, the work required includes:

Foundations Investigation – Jacques Whitford Limited

- Two of the boreholes will be drilled at either end (inlet / outlet) of the existing culvert.
- The boreholes will be drilled and sampled to either:
 - refusal as defined by the Standard Penetration test exceeding 100 blows per 300 mm of penetration. Boreholes will penetrate 3 m into competent material. ✓
 - If bedrock is encountered, the borehole will be extended further by coring for 3 m. ✓
 - A minimum depth of 10 m below the culvert invert, provided that sufficient geotechnical resistance is achieved. Based on our understanding of the soil conditions in the area, it has been assumed during cost estimation that the boreholes will terminate no deeper than 10 m below the culvert invert. Should soft soils be encountered at the planned termination depth, MTO will be contacted immediately with an additional cost estimate and recommendation to further extend the boreholes.
- A third borehole will be drilled in the shoulder of the roadway adjacent to the culvert. ✓
- The borehole will be drilled and sampled to either:
 - Refusal as defined by the Standard Penetration test exceeding 100 blows per 300 mm of penetration. Boreholes will penetrate 3 m into competent material. ✓
 - If bedrock is encountered, the bedrock will not be cored.
 - A minimum depth of 10 m below the culvert invert, provided that sufficient geotechnical resistance is achieved. Based on our understanding of the soil conditions in the area, it has been assumed during cost estimation that the boreholes will terminate no deeper than 10 m below the culvert invert. Should soft soils be encountered at the planned termination depth, MTO will be contacted immediately with an additional cost estimate and recommendation to further extend the boreholes. ✓
- Soil samples will be acquired at 1.5 m intervals during the course of Standard Penetration Testing. In critical foundation zones, the sampling interval will be reduced to 0.75 m. ✓
- In-situ vane shear testing will be carried out in cohesive soils, if encountered. ✓
- Shelby tube samples will be acquired from soft clay soils, if encountered. ✓
- Standpipes will be installed in at least one borehole. ✓
- Approximately 25% of the samples will be tested for gradation, moisture content and Atterburg Limits (as appropriate). It is not anticipated that consolidation (oedometer) testing will be required for this assignment. Should soft soils be encountered consolidation testing will be recommended as an extra cost to the present program. ✓
- A Foundation Investigation and Design Report in accordance with MTO Protocols will be prepared. The report will include an evaluation of alternative foundation schemes and embankment designs. The evaluation will be presented in tabular form based on the advantages, disadvantages, relative costs and risks/consequences for each alternative. It is currently envisioned that comparisons will be made between: open footing vs box culverts; cast-in-place vs precast concrete; concrete vs other materials such as steel and HDPE. The report will recommend a preferred alternative based upon foundation technical considerations and cost effectiveness.
- Recommendations for structure foundations will include foundation type, axial resistances, founding elevations, lateral and sliding resistances, backfill, cover, inlet seals, inlet erosion control, outlet cut-off and outlet erosion control. As well, recommendations will be provided concerning construction of the proposed culvert including shoring, dewatering and staging. ✓
- The proposed work (including planning, licensing, construction, maintenance, abandonment and reporting) will be carried out in accordance with MOE Reg. 903 and its Amendment. ✓

Pavement Investigation – Jacques Whitford Limited

- Drill a total of eight boreholes. The boreholes will be drilled in pairs (one at the edge of existing pavement and the other at the toe of slope), with a pair located in each of the four quadrants around the culvert/highway.
- Boreholes will extend to a depth of 1.5m below grade; should soft soils be encountered at the planned termination point, the boreholes will be extended to reach competent material or to a maximum depth of 3.5 m.
- Soil samples will be acquired off the augers.
- Three of the native subgrade samples will be tested for gradation and moisture.
- A Supplementary Pavement Investigation Letter report will be prepared.
- Recommendations will be provided concerning site preparation, embankment construction and pavement design for the proposed temporary widening.

Hydraulic Analysis – MacViro Consultants

- The hydraulic performance of the culvert will be assessed based on MTO guidelines and standards, the most current edition of the CHBDC, and CAN/CSA-S6-00.
- For Highway 7, per MTO Directive B-100, bridges and culverts with spans less than 6.0 m are designed for the 25-year design storm event with 1.0 m freeboard. Culverts shall pass the 100-year storm without overtopping the highway and the culvert shall not increase upstream flood risk.
- The hydraulic analysis of the culvert replacement alternatives (assuming 3 alternatives) will be assessed and recommend preferred alternatives.
- The Drainage and Stormwater Management Report for Highway 7 will be updated with this information and analysis.

Stage II Archaeology Assessment – C.R. Murphy Archaeology

- The Stage II assessment will involve systematic archaeological investigation, under suitable field conditions, of the undisturbed lands to be impacted by the replacement of the Rudsdale Creek Culvert.
- The Stage II archaeological assessment will include systematic hand shovel test pitting with all test pit soils screened through 6.0 mm mesh.
- A five-metre test pit grid interval is required for this project, as all well drained ground is within 400 metres of a natural water source. Five-metre interval test pits within 400 metres of a watercourse area a requirement of the Ontario Ministry of Culture (MCR) Archaeological Assessment Technical Guidelines, Stages I-III (1993).
- A detailed archaeological licence report of the Stage II activities undertaken will be provided to fulfill the requirements of the Ontario Environmental Assessment Act (R.S.O 1990) and the Ontario Heritage Act, Regulation 212/82.

Environmental Impacts – EcoTec Environmental Consultants

- A review of the proposed design will be conducted and its impacts to the environment will be determined.
- It is anticipated that additional fisheries compensation will be required to offset the increased culvert footprint and temporary widening and construction works. As such, additional design effort and communications with MNR will be required.

Highway Design – Morrison Hershfield Limited

- Assess and site review potential staging options and transfer lanes/detours, including natural environment impacts.
- Arrange and conduct meetings, liaison and prepare agreements with supply /services authorities regarding power supply services and relocations due to electrical construction work (to be covered under the Contract Contingency for Temporary Signals.) *(If Required and upon MTO authorization).*
- Develop horizontal and vertical alignments for the transfer lanes/detours.
- Review impacted drainage patterns and provide remedial measures.
- Update Traffic Management Report with staging requirements.
- Identify all other associated work such as modifications to guide rail, ditching, signing, culverts, typical sections, design cross-sections and grading templates in LDD/HDS, removals and quantity estimating.
- Undertake design work to provide temporary illumination at the entrance and exit locations of the transfer lanes (to be covered under the Contract Contingency for Temporary Signals.) *(If Required and upon MTO authorization).*
- Prepare display boards for the Public Involvement Centre No. 2.
- Prepare all contract documentation including specifications, estimating, quantity sheets, operational constraints, etc.
- Incorporate staging and culvert replacement into TESR.
- Project Management / Quality Control

Structural Design – Morrison Hershfield Limited

- Review of reference documentation.
- Development and review of alternatives for the replacement of the existing Rudsdale Creek Culvert.
- Prepare preliminary design and drawings for the culvert replacement.
- Review preliminary design comments and incorporate comments / update design and drawings.
- Prepare structural design and contract drawings to 100%.
- Update TESR with culvert replacement / alternatives.
- Project Management / Quality Control

SCHEDULE

Upon receiving MTO's authorization to proceed we can commence this work within one week and anticipate that a total of twelve (12) weeks will be required to complete the design. As this is an integral part of the assignment, the 90% Progress Meeting / Technical Review Meeting will be impacted as the culvert design needs to be included in the contract package submitted for review and discussion. As such, based upon the Ministry's approval process, it is anticipated that the 90% meeting will move to June 2007; this will be better determined once the Ministry has given direction to proceed on this scope change and the scope change can be incorporated into a new project schedule. MH will liaison on an as required basis with Ministry sections to obtain input and review design issues. MH will ensure MTO's Project Manager is copied on all design correspondence. This work will form part of the 90% submission.

Ongoing design efforts will continue with the remainder of the project, for those items not impacted by the Rudsdale Creek Scope Change. This is possible due to the independent nature of the scope change. A primary exception to the above is the completion of the Traffic Management Report and proposed Construction staging and presentation to Executive.

BUDGET/LEVEL OF EFFORT

The required Level of Effort, Budget Fees and Disbursements to complete the work are **\$95,839.40** as detailed in the attached spreadsheet. The spreadsheet provides a breakdown of work activities, estimated staff person hours and hourly billing rates in accordance with Table 2, Listing of Staff Hourly Rates for Extra Work of our proposal submission and disbursements.

The foregoing budget has been developed as additional work to the remaining Structural budget that forms part of the original contract. The effort carried in the proposal was to investigate the culvert, prepare a report and detail rehabilitation strategies; it was noted within an Addendum during Proposal preparation that detail design efforts for replacement would be considered as additional work. As such, we have only quoted the additional work required above that we carried in our proposal. It should be noted in the attached spreadsheet that no allowance has been provided for structural specification preparation, structural attendance at meetings, etc.

We respectfully submit this request for your approval. Please do not hesitate to contact me at (613) 739-2910 ext. 2261 or by email at lmacdonald@morrisonhershfield.com should you require further information.

Yours truly,

MORRISON HERSHFIELD LIMITED



Lincoln S. MacDonald, P. Eng.
Senior Project Manager

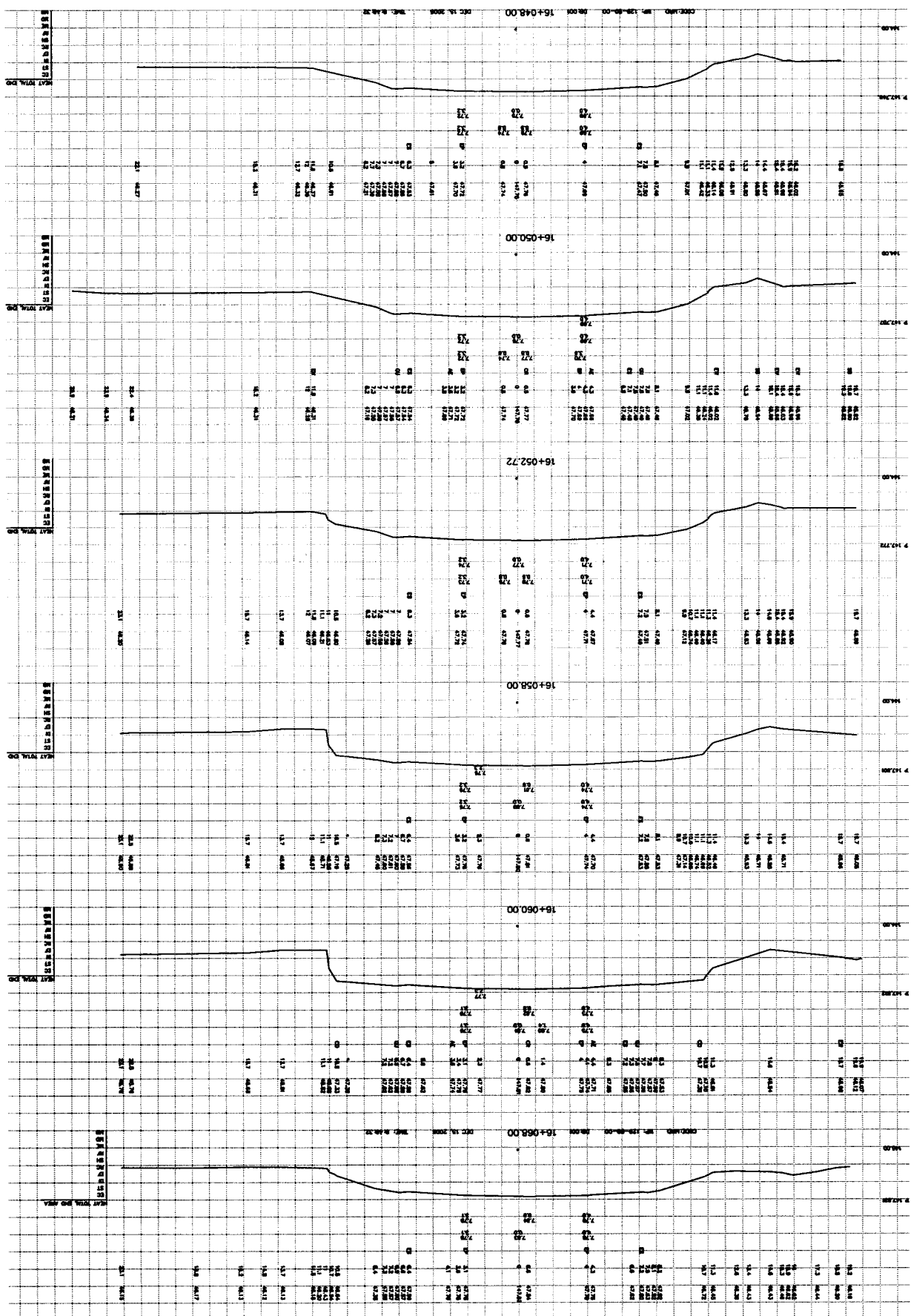
L:\PROJ\2054007\100 - CORRESPONDENCE\104 - SCOPE CHANGES & ADDENDUM\RUDSDALE CREEK CULVERT REPLACEMENT\LSM.EH.MTO - RUDSDALE CREEK CULVERT REPLACEMENT - REVISED JANUARY 31, 2007.DOC

December 8, 2006
Revised January 31, 2007

MTO WP. 129-80-00 Highway 7
Ruddale Creek Culvert Replacement

Activity	Description	Estimated Hours to Complete								Total	Cost
		L. MacDonald, Project Management	J.P. Rouleau, Senior Highway Designer	C. Young AutoCAD/HDS	A. Harkness, Senior Environmental Engineer	C. Le, Senior Structural Engineer	W. Lam, Int. Structural Engineer	M. Baitgofsky, Structural CAD Technician	J. Douglas/ Quality Control Auditor		
HIGHWAY DESIGN											
1	Scope Change Assessment and Preparation	5								5	\$ 700.00
2	Assessment of Potential Staging Options and Configurations	2	6							8	\$ 790.00
3	Assessment of Potential Horizontal Alignments Including Tie-in to Existing Mainline Alignment for Detours	2	4	4						10	\$ 960.00
4	Development of Horizontal Alignments Including Tie-in to Existing Mainline Alignment for Detours		6	12						18	\$ 1,530.00
5	Development of Vertical Alignments Including Tie-in to Existing Mainline Alignment for Detours	2	6	12						20	\$ 1,810.00
6	Review Drainage Design Impacts of Detours		4							4	\$ 340.00
7	Update Traffic Management Report with Staging Requirements	2		6						8	\$ 790.00
8	Update contract drawings completed to date including new conditions and removals, typical sections, traffic staging, pavement markings and signage, composite utility, etc.	4	15	32						51	\$ 4,555.00
9	Develop HDS / LDD templates, cross-sections, volume reports for detours		15	32						47	\$ 3,995.00
10	Review and update guide rail design including clear zone and slope flattening		4							4	\$ 340.00
11	Prepare contract documentation including specifications, estimating and quantity sheets, operational constraints, etc.	2	15							17	\$ 1,555.00
12	PIC No. 2 Display boards and Council presentation powerpoints to document the culvert replacement and staging	4	4	10						18	\$ 1,750.00
13	Incorporate culvert replacement and staging into TESR	1			6					7	\$ 860.00
STRUCTURAL DESIGN											
14	Review of Reference Documentation						5			5	\$ 425.00
15	Review Alternatives for New Concrete Culvert					7.5	20			27.5	\$ 2,787.50
16	Review / Assess Navigable Waters	2				4	7.5			13.5	\$ 1,487.50
17	Prepare Preliminary Design and Drawings for Concrete Culvert Replacement					4	25	30		59	\$ 5,105.00
18	Review Preliminary Design Comments and Update Design Drawings					2	4			6	\$ 630.00
19	Prepare Structural Design and Drawings to 100% complete for Culvert Replacement					5	30	50		85	\$ 7,275.00
20	Prepare Structural Documents incl. Items, quantity sheets, etc.					3	20			23	\$ 2,135.00
21	Project Management, Administration & QC	25	4			9			4	42	\$ 5,725.00
Total Hours		51	83	108	6	34.5	111.5	80	4	478	
Hourly Billing Rates (From Table 2)		\$ 140.00	\$ 85.00	\$ 85.00	\$ 120.00	\$ 145.00	\$ 85.00	\$ 80.00	\$ 145.00		\$ -
Total Labour Cost		\$ 7,140.00	\$ 7,055.00	\$ 9,180.00	\$ 720.00	\$ 5,002.50	\$ 9,477.50	\$ 6,400.00	\$ 580.00	\$ 45,555.00	\$ 45,555.00
Disbursements											
Reproductions, Printing and courier		\$ 500.00									
Plotting		\$ 500.00									
Sub-Consultants											
Jacques Whitford Limited - Foundations Investigation		\$ 27,424.00									
Jacques Whitford Limited - Pavement Investigation		\$ 6,880.00									
MacViro - Hydrology / Hydraulic Analysis		\$ 4,500.00									
EcoTec Environmental - Additional Fisheries		\$ 1,800.00									
C.R. Murphy Archaeology - Stage II Assessment		\$ 4,200.00									
10% Administration for Subconsultants		\$ 4,480.40									
(covers Administration / Project Management / Quality Control Review of Subconsultants)											
Total		\$ 50,284.40									
Total MH Costs		\$ 95,839.40									

Morrison Hershfield Limited
Consultant Agreement No. 4004 -E- 0016



Sangiuliano, Tony (MTO)

From: Sangiuliano, Tony (MTO)
Sent: 23-Nov-04 9:40 AM
To: Horba, Ed (MTO)
Subject: FW: WP 129-80-00 RFP Highway 7 from County Road 38 to Wemyss

Ed:

Stephen Senior and myself have completed our review of the proposed approach to retain Rock Slope Hazard Foundation Engineering services for the abovementioned project. We feel that the approach and the suggested wording is appropriate.

If you have any further questions, please do not hesitate to contact our office.

Tony

-----Original Message-----

From: Senior, Stephen (MTO)
Sent: 22-Nov-04 3:27 PM
To: Sangiuliano, Tony (MTO)
Subject: RE: WP 129-80-00 RFP Highway 7 from County Road 38 to Wemyss

Tony, the wording below seems appropriate. I would add the need for required drawings as well as applicable SSP/NSSP's. The work, if required, does not seem onerous and the contingency cost of \$30,000 should be more than sufficient.

-----Original Message-----

From: Sangiuliano, Tony (MTO)
Sent: November 19, 2004 11:29 AM
To: Senior, Stephen (MTO)
Subject: FW: WP 129-80-00 RFP Highway 7 from County Road 38 to Wemyss

Stephen:

Any comments on how this assignment should be administered?

Tony

-----Original Message-----

From: Horba, Ed (MTO)
Sent: 19-Nov-04 11:01 AM
To: Sangiuliano, Tony (MTO)
Cc: Filson, Todd (MTO)
Subject: WP 129-80-00 RFP Highway 7 from County Road 38 to Wemyss

Hi Tony

As discussed earlier today, I have had several questions for the need of a rock mechanic specialist under the foundations section for the above noted assignment. Generally the project consists of 29 km of which 13 will be reconstructed (most rock cuts in this section will be cut back to accommodate intersection and passing lanes) and the remaining 16 km will strictly be roadside hazard review and updates. Since the review has not been completed it is

Not clear at this stage whether the cuts would be protected, cut back or just removed. We anticipate such decision to be made at the 30% stage of the assignment. There is one Class A cut which we know will be cut back and 16 Class B sites which treatments for most are yet to be determined.

As such we were planning on including the need for consultants to retain a specialist or team for the work and include a contingency amount in the assignment. The wording below was used in Jim Sampson's assignment and seems appropriate for this project as well.

Rock Slope Hazard consultant services required for this assignment have been categorised as **medium** complexity, **Foundation Engineering** specialty. The TPM Consultant shall provide a Rock Slope Hazard Consultant for the engineering services related to the treatment of rock slopes or potential rock fall hazards within the project limits.

The Rock Slope Hazard Consultant shall assess the design alternatives and options and shall verify the constructability for all rock slope and rock fall hazard treatments presented in these reports. The Rock Slope Hazard Consultant shall make final design recommendations for all areas of rock slope and rock fall hazards within the project limits. The Rock Slope Hazard Consultant shall identify all necessary standard special provisions to be included with the Contract Documents and shall provide any additional non-standard special provisions required for the construction of the final recommended design(s).

The TPM consultant shall submit needs and justification for the foundations investigations, along with a work plan and cost estimate once rock cut treatments have been analysed. The TPM consultant shall not commence any foundations work, field or office, without written authorization from the Ministry. The TPM consultant shall carry **\$30,000.00** as contingency funds in the assignment, should the need for foundations work be approved.

I would appreciate any input from yourself and Steve Senior for inclusion in the RFP addendum.

Thanks Ed