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FOUNDATION INVESTIGATION AND DESIGN REPORT
MANNING ROAD EMBANKMENTS
HIGHWAY 401
FROM 1.5 KILOMETRES WEST OF MANNING ROAD EASTERLY TO 1.3 KILOMETRES EAST OF PUCE ROAD
GWP 62-00-00, PURCHASE ORDER NO. 3005-A-000393
MINISTRY OF TRANSPORTATION
SOUTHWESTERN REGION

Submitted to:

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PART A – FOUNDATION INVESTIGATION REPORT

MANNING ROAD EMBANKMENTS
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Golder Associates

1.0 INTRODUCTION

Golder Associates Ltd. (Golder Associates) has been retained by Dillon Consulting Limited (Dillon) on behalf of the Ministry of Transportation, Ontario (MTO) to carry out foundation investigations as part of the detail design work for GWP 62-00-00. The project involves the detail design of the improvements at the Highway 401/Manning Road interchange and the Highway 401/Puce Road interchange and the rehabilitation of the Maidstone Township Concession Roads 6 and 9 underpasses near Windsor, Ontario. The foundation component of the project includes:

i) The grade raise and widening of the approach embankment/ramps at Manning Road;
ii) Culvert extensions/replacements;
iii) Overhead and breakaway signs;
iv) Widening of the existing Puce River structure; and
v) Widening of the existing Pike Creek structure.

This report addresses the proposed grade raise and widening of the high approachs/ramps for the embankments at the Manning Road interchange.

The purpose of the foundation investigation was to determine the subsurface conditions at the location of the proposed embankment widening by drilling boreholes and carrying out in situ and laboratory tests on selected samples. The terms of reference for the scope of work are outlined in the MTO's Request for Proposal and in Golder Associates' proposal P31-3115 dated February 2, 2004. The work was carried out in accordance with our Quality Control Plan for Foundations Engineering dated March 29, 2004.

The centreline and stations of the alignment were surveyed by others prior to commencing the foundation investigation program. Dillon provided Golder Associates with preliminary drawings for this project in digital format.

2.0 SITE DESCRIPTION

GWP 62-00-00 comprises the design of widening of Highway 401 from Manning Road to Puce Road and associated work near Windsor, Ontario. The location of the project is shown on the Key Plan, Figure 1.

This section of Highway 401 is currently a four lane divided freeway with a depressed grass median. Manning Road within the project limits is a two lane roadway. The existing Manning Road/Highway 401 interchange consists of four ramps, two in each of the southwest and northeast quadrants.

The topography in the area of the site is generally flat with the existing embankment fills at the Manning Road structure rising as much as 6.5 metres above the adjacent lands. The existing embankment side slopes are at inclinations of 1.9 to 2.5 horizontal to one vertical. The areas outside of the paved surfaces are well vegetated with grasses. The primary land use in the area is agricultural.

2.1 Site Geology

The project lies within the Essex Clay Plain, a subregion of the physiographic region of southern Ontario known as the St. Clair Clay Plains, identified in "The Physiography of Southern Ontario" by Chapman and Putnam (1984). The clay plain is described as a till plain that has been smoothed by shallow deposits of lacustrine clay which settled in the depressions of the till. The prevailing soil type is reportedly the Brookston clay.

Based on the Ontario Department of Mines and Northern Affairs Preliminary Maps P.749 and P.750 entitled "Quaternary Geology of the Windsor-Essex Area" Western and Eastern Parts, respectively, the project area is reportedly located in predominantly clayey silt till. At the Manning Road interchange, a thin and discontinuous glaciolacustrine medium sand layer reportedly overlies the clayey silt till in the southeast, southwest and part of the northwest quadrants.

The underlying bedrock is reported to be limestone of the Dundee Formation of Middle Devonian age.

3.0 INVESTIGATION PROCEDURES

The field work for this portion of the investigation was carried out between August 5 and 24, 2004, at which time eight boreholes were drilled in the areas of the proposed grade raise and embankment widening. The locations of the boreholes are shown on the Borehole Location Plan, Drawing 1. The table below summarizes the borehole locations, ground surface elevations at the borehole locations and borehole depths.

BOREHOLE	LOCATION (m)		GROUND SURFACE ELEVATION (m)	BOREHOLE DEPTH (m)	FOUNDATION ELEMENT
	Northing	Easting			
1	4677770.8	273961.5	188.98	8.08	south approach
2	4677923.7	273959.1	192.19	11.13	south approach
3	4678029.1	273973.2	192.14	11.13	north approach
4	4678189.2	273953.0	185.60	8.08	north approach
5	4678087.9	273940.8	185.68	8.08	north approach
6	4678138.6	273989.6	185.56	8.84	north approach
7	4677873.0	273940.5	185.63	8.84	south approach
8	4677825.1	273941.5	185.60	8.84	south approach

The investigation was carried out using a truck mounted CME 55 and an all-terrain vehicle mounted CME 75 power auger supplied and operated by a specialist drilling contractor. In the boreholes, samples of the overburden were obtained at suitable intervals of depth using 50 millimetre outside diameter split spoon sampling equipment in accordance with the standard penetration test (SPT) procedures. In addition, in situ vane shear strength testing was carried out in the softer cohesive strata, where feasible. The boreholes were terminated between 8.1 and 11.1 metres below the exiting ground surface. Groundwater conditions in the boreholes were observed throughout the drilling operations and these observations are indicated on the corresponding Record of Borehole sheets. The boreholes were generally backfilled with a mixture of auger cuttings and bentonite. A bentonite plug was provided just below ground surface in all of the boreholes.

The field work was supervised on a full-time basis by experienced members of our engineering staff who located the boreholes in the field, directed the drilling, sampling and in situ testing operations and logged the boreholes. The samples were identified in the field, placed in labelled containers and transported to our London laboratory for further examination and testing. Index and classification tests consisting of water content determinations, grain size distribution analyses

and Atterberg limits determinations were carried out on selected samples. The results of the testing are shown on the Record of Borehole sheets and in Appendix A.

The as-drilled borehole locations and ground surface elevations at the boreholes were determined by AGM Surveying and Engineering. The locations of the boreholes are shown on the Record of Borehole sheets and on Drawing 1, attached.

4.0 SUBSURFACE CONDITIONS

4.1 Site Stratigraphy

The detailed subsurface soil and groundwater conditions encountered on the boreholes, together with the results of the in situ and laboratory testing carried out on selected samples, are given on the attached Record of Borehole sheets following the text of this report and in Appendix A. The stratigraphic boundaries shown on the Record of Borehole sheets are inferred from non-continuous samples and observations of drilling resistance and, therefore, may represent transitions between soil types rather than exact planes of geological change. Further, the subsurface conditions will vary between and beyond the borehole locations.

In general, the boreholes drilled through the approaches encountered the pavement or shoulder structures and cohesive fill materials which are underlain by firm to very stiff silty clay and firm to hard silty clay till. The boreholes drilled adjacent to the approach embankments generally encountered surficial topsoil and fill underlain by firm to hard silty clay till.

The locations and elevations of the boreholes, together with the interpreted stratigraphic profiles, are shown on the attached Drawings 1, 2, 3 and 4. A detailed description of the subsurface conditions encountered in the boreholes is provided on the Record of Borehole sheets and is summarized in the following sections.

4.2 South Approach

Boreholes 1, 2, 7 and 8 were drilled in the area of the south approach fill.

4.2.1 Topsoil

Topsoil was encountered at ground surface in boreholes 7 and 8. The topsoil was about 0.2 metres thick at the borehole locations.

Buried topsoil was encountered beneath the fill in borehole 2 at elevation 185.5 metres. The buried topsoil was about 0.3 metres thick at the borehole location.

4.2.2 Pavement Structure

The existing pavement and shoulder structures were encountered at ground surface in boreholes 1 and 2, respectively. The pavement structure in borehole 1 consisted of 0.2 metres of asphalt, 0.2 metres of crushed granular base and 0.2 metres of granular subbase. The shoulder structure

encountered in borehole 2 consisted of 0.4 metres of crushed granular base and 0.2 metres of granular subbase.

4.2.3 Fill

Fill materials were encountered beneath the granular subbase in boreholes 1 and 2 at elevation 188.3 metres and elevation 191.6 metres, respectively. The fill materials consisted predominantly of silty clay, with some relatively thin layers of silty sand and sand and gravel.

The fill materials were some 2.9 and 6.1 metres thick in boreholes 1 and 2, respectively near the beginning and end of the embankment. The fill had measured N values, as determined in the standard penetration testing, from 9 to 37 blows per 0.3 metres and had in situ water contents of 10 to 14 per cent. The cohesive fill materials had corresponding plastic and liquid limits of 16 and 34 per cent, respectively. The Atterberg limits data is shown on the Plasticity Chart, Figure A-3.

A grain size distribution curve for a sample of the cohesive fill from borehole 1 is shown on Figure A-1.

Fill materials were also encountered beneath the topsoil in borehole 7 at elevation 185.4 metres. The fill was some 0.4 metres thick at the borehole location and consisted of silty clay.

4.2.4 Silty Clay

Beneath the fill in borehole 1 at elevation 185.3 metres and beneath the buried topsoil in borehole 2 at elevation 185.2 metres, stiff silty clay was encountered. The silty clay layers were about 0.8 and 1.5 metres thick in boreholes 1 and 2 respectively. The silty clay had measured N values of 12 to 14 blows per 0.3 metres and had natural water contents of about 22 per cent.

4.2.5 Silty Clay Till

Beneath the silty clay in boreholes 1 and 2 at elevation 184.6 and 183.7 metres, respectively, beneath the fill in borehole 7 at elevation 185.0 metres, and beneath the surficial topsoil in borehole 8 at elevation 185.5 metres, the boreholes encountered and were terminated in an extensive deposit of silty clay till. The silty clay till was explored for some 2.6 to 8.7 metres prior to terminating the boreholes. The silty clay till had measured N values of 5 to 58 blows per 0.3 metres. In situ vane shear strength testing carried out in boreholes 7 and 8 indicated undrained shear strengths greater than 144 kilopascals (kPa). The silty clay till had natural water contents of 9 to 21 per cent with an average water content of about 17 percent and corresponding average

plastic and liquid limits of 14 and 30 per cent, respectively. The Atterberg limits data is shown on the Plasticity Chart, Figure A-3.

Grain size distribution curves for samples of the silty clay till are shown on Figure A-2.

4.3 North Approach

Boreholes 3, 4, 5 and 6 were drilled in the area of the north approach fill.

4.3.1 Topsoil

A layer of topsoil about 0.2 metres thick was encountered at ground surface in borehole 6.

Buried topsoil was encountered beneath the shoulder pavement structure at elevation 185.4 metres in boreholes 4 and 5. The buried topsoil was about 0.2 to 0.3 metres thick at the borehole locations.

4.3.2 Pavement Structure

The existing pavement and shoulder structures were encountered at ground surface in boreholes 3, 4 and 5. The pavement structure in borehole 3 consisted of 0.2 metres of asphalt, 0.2 metres of crushed granular base and 0.3 metres of granular subbase. The shoulder structure encountered in borehole 4 consisted of 0.1 metres of crushed granular base and 0.3 metres of granular subbase. In borehole 5, the shoulder structure consisted of 0.2 metres of crushed granular base and 0.1 metres of granular subbase.

4.3.3 Fill

Fill materials were encountered beneath the granular subbase in borehole 3 at elevation 191.4 metres. The fill materials consisted predominantly of silty clay, with some relatively thin layers of silty sand.

The fill materials were some 5.7 metres thick at this borehole location near the abutment. The fill had measured N values from 14 to 53 blows per 0.3 metres and had in situ water contents of 8 to 21 per cent with an average water content of about 15 per cent.

4.3.4 Silty Clay

Beneath the buried topsoil in boreholes 4 and 5 at elevation 185.1 and 185.3 metres, respectively, firm to stiff silty clay was encountered. The silty clay layers were about 1.8 and 1.0 metres thick in boreholes 4 and 5, respectively. The silty clay had measured N values of 6 to 13 blows per 0.3 metres and had natural water contents of about 19 per cent. In situ vane shear strength testing attempted in borehole 4 indicated undrained shear strengths of greater than 144 kPa.

4.3.5 Clayey Silt Till

Hard clayey silt till was encountered beneath the upper silty clay till in borehole 5 at elevation 183.6 metres. The clayey silt till was about 0.8 metres thick at the borehole location, had a measured N value of 55 blows per 0.3 metres and a natural water content of 12 per cent.

4.3.6 Silt

Dense silt was encountered beneath the clayey silt till in borehole 5 at elevation 183.1 metres. The silt layer was about 0.3 metres thick at the borehole location, had a measured N value of 55 blows per 0.3 metres and a natural water content of 18 per cent.

4.3.7 Silty Clay Till

Beneath the fill in borehole 3 at elevation 185.4 metres, beneath the silty clay in boreholes 4 and 5 at elevation 183.3 and 184.3 metres, respectively, beneath the silt in borehole 5 at elevation 182.8 metres, and beneath the surficial topsoil in borehole 6 at elevation 185.3 metres, silty clay till was encountered. These boreholes were terminated in an extensive deposit of silty clay till after exploring the till for some 4.4 to 8.6 metres. Where fully penetrated in borehole 5, the upper silty clay till layer was about 0.8 metres thick. The silty clay till had measured N values of 8 to 68 blows per 0.3 metres. The silty clay till had natural water contents of 13 to 21 per cent with an average water content of about 17 percent and had corresponding average plastic and liquid limits of 15 and 34 per cent, respectively. The Atterberg limits data is shown on the Plasticity Chart, Figure A-3.

Grain size distribution curves for samples of the silty clay till recovered from the standard penetration testing are provided on Figure A-2.

4.4 Groundwater Conditions

All of the boreholes, except borehole 4, remained dry during drilling. Groundwater was encountered in borehole 4 some 2.1 metres below ground surface or at elevation 185.3 metres. Details of the groundwater conditions encountered in the boreholes are provided on the Record of Borehole sheets.

The groundwater levels are expected to fluctuate seasonally and are expected to be higher during periods of sustained precipitation or during spring melt conditions.

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PART B – FOUNDATION DESIGN REPORT

FOUNDATION INVESTIGATION AND DESIGN REPORT
MANNING ROAD EMBANKMENTS
HIGHWAY 401
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5.0 ENGINEERING RECOMMENDATIONS

5.1 General

This section of the report provides our recommendations on the foundation aspects of the design of the proposed grade raise and widening of the approach embankment fills at the Manning Road interchange which are based on our interpretation of the factual information obtained during the investigation. It should be noted that the interpretation and recommendations are intended for use only by the design engineer. Where comments are made on construction they are provided only in order to highlight those aspects which could affect the design of the project. Those requiring information on aspects of construction should make their own interpretation of the factual information provided as it may affect equipment selection, proposed construction methods and scheduling.

5.2 Embankment Grade Raise and Widening

Based on the information provided, it is understood that the existing Manning Road approach embankments will be raised as much as 1 metre between Station 9+590 and Station 10+340. The existing embankments are as much as 6.5 metres high with side slope inclinations of 1.9 to 2.5 horizontal to 1 vertical.

Manning Road will also be widened as part of this project to accommodate two 3.75 metre traveled lanes, 2.5 metre wide shoulders (including 0.5 metre partially paved shoulders) and a 0.5 metre rounding for a total finished crest width of about 13 metres. Additional widening will also be required to accommodate new ramps and speed change lanes, as required. Based on the survey sections provided, the current crest width varies from about 10 to 13 metres.

Based on the subsurface conditions encountered in the boreholes, generally stiff to hard clayey fill materials are present in the existing embankment. In one borehole, the fill materials are underlain by a layer of clayey topsoil. Beneath the topsoil and fill, an extensive stratum of predominantly firm to hard silty clay till is present.

5.2.1 Settlement

Based on the information provided, an approximately 1 metre grade raise and 1.5 metre widening of the existing approach embankments are proposed. Settlement analyses were carried out for the approach embankments based on the borehole and in-situ vane shear strength data obtained during the investigation. In addition, the results of oedometer testing carried out on samples obtained from other components of the project were considered. The following parameters were used in the analysis:

SOIL UNIT	RECOMPRESSION INDEX, C_r (over consolidated crust)	COMPRESSION INDEX, C_c' (normally consolidated zone)	INITIAL VOID RATIO, e_o
Silty Clay Till	0.033	0.114	0.46

The embankment fill loads were modeled both as a rectangular wedge having the dimensions of the existing and proposed fill as well as an infinitely long embankment. Based on the results of the analyses, it is estimated that some 50 millimetres of total settlement of the completed embankments will occur. Further, it is estimated that 50 per cent of this settlement will occur in the first year and that 90 per cent of this settlement will occur after about 5 years. It is recommended that the widening be carried out as soon as possible in advance of bridge construction to allow some of this settlement to take place.

5.2.2 Stability

Stability analyses were carried out for completed embankments. The analyses considered the effects of the loads applied at the top of the bank together with the interaction between the stiffer crust and the underlying softer silty clay soils as well as variations in the subsurface conditions at the various borehole locations. Based on the results of the analyses, embankments constructed with side slopes inclined at 2 horizontal to 1 vertical or flatter are estimated to have a factor of safety of greater than 1.3.

5.2.3 Subgrade Preparation and Embankment Construction

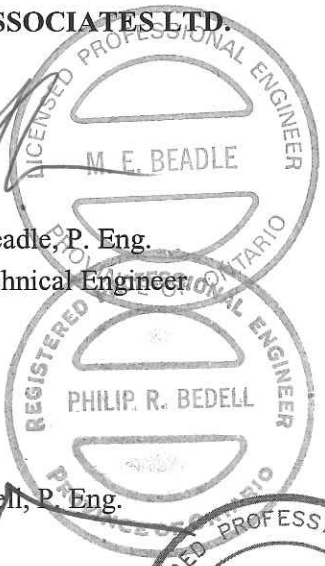
All surficial topsoil, fill, and otherwise deleterious materials should be stripped from the area of the embankment widening. The exposed subgrade should then be proofrolled prior to fill placement under the direction of qualified geotechnical personnel. In addition, all surficial topsoil and deleterious fill materials should be removed from the existing embankment slope.

The lower 1.5 metres of the embankment widening should be constructed using Granular B Type I or an approved granular borrow such as Select Subgrade Material (SSM). The purpose for specifying granular fill materials is to provide a material that is capable of providing enhanced drainage for the existing embankment due to the presence of some silty sand and gravel at the base of the existing embankment. Should a less permeable material be utilized, pore pressure may elevate behind the widened portion, which could potentially adversely impact embankment stability. The remainder of the embankment may be constructed using inorganic clayey borrow or Granular A material, if required for traffic staging.

The embankment fill material should be placed in maximum 300 millimetre thick loose lifts properly benching into the existing embankment as per Ontario Provincial Standard Drawing (OPSD) 208.010 and compacted. Upon completion of filling to proposed subgrade level, the embankment side slopes should be trimmed to a final inclination of two horizontal to one vertical or flatter.

All excavations should be carried out in accordance with the guidelines outlined in the latest edition of the Ontario Occupational Health and Safety Act and Regulations For Construction Projects. The fill at this site would be classified as a Type 3 soil, and the clayey silt, silty clay and silty clay till would be classified as Type 2 soils.

GOLDER ASSOCIATES LTD.



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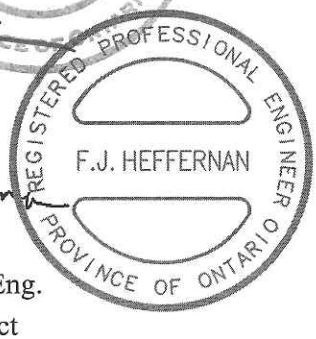

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LIST OF ABBREVIATIONS

The abbreviations commonly employed on each "Record of Borehole", on the figures and in the text of the report, are as follows:

I. SAMPLE TYPES

AS auger sample
CS chunk sample
DO drive open
DS Denison type sample
FS foil sample
RC rock core
ST slotted tube
TO thin-walled, open
TP thin-walled, piston
WS wash sample
SS split spoon

II. PENETRATION RESISTANCES

Dynamic Penetration Resistance:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 0.3 m (12 in.).

Standard Penetration Resistance, N:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) drive open sampler for a distance of 0.3 m (12 in.).

WH sampler advanced by static weight-weight, hammer

PH sampler advanced by hydraulic force

PM sampler advanced by manual force

III. SOIL DESCRIPTION

(a) *Cohesionless Soils*

Relative Density	"N" Blows/0.3 m or Blow/ft.
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	over 50

(b) *Cohesive Soils*

Consistency	"Cu" = "Su" kPa	psf.
Very soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1000
Stiff	50 to 100	1000 to 2000
Very stiff	100 to 200	2000 to 4000
Hard	over 200	over 4000

IV. SOIL TESTS

C consolidation test
H hydrometer analysis
M sieve analysis
MH combined analysis, sieve and hydrometer [1]
Q undrained triaxial [2]
R consolidated undrained triaxial [2]
S drained triaxial
U unconfined compression
V field vane test
Chem chemical analysis

NOTES:

1. Combined analyses when 5 to 95 per cent of the material passes the No. 200 sieve.
2. Undrained triaxial tests in which pore pressures are measured are shown as Q or R.

LIST OF SYMBOLS

I. GENERAL

$\pi = 3.1416$
e = base of natural logarithms 2.7183
$\log_e$ a or ln a, natural logarithm of a
$\log_{10}$ a or log a, logarithm of a to base 10

t	time
g	acceleration due to gravity
V	volume
W	weight
m	mass
M	moment
F	factor of safety

II. STRESS AND STRAIN

u	pore pressure
σ	normal stress
σ'	normal effective stress (σ is also used)
τ	shear stress
ε	linear strain
ε_{sy}	shear strain
υ	Poisson's ration (μ is also used)
E	modulus of linear deformation (Young's modulus)
G	modulus of shear deformation
K	modulus of compressibility
η	coefficient of viscosity

III. SOIL PROPERTIES

(a) *Unit weight*

γ	unit weight of soil (bulk density)
γ_s	unit weight of solid particles
γ_w	unit weight of water
γ_d	unit dry weight of soil (dry density)
γ'	unit weight of submerged soil
G_s	specific gravity of solid particles $G_s = \gamma_s/\gamma_w$
e	void ratio
n	porosity
w	water content
S_r	degree of saturation

(b) *Consistency*

w_L	liquid limit
w_P	plastic limit
I_P	plasticity index
w_S	shrinkage limit
I_L	liquidity index = $(w - w_p)I_p$
I_C	consistency index - $(w_L - w)/I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
D_r	relative density = $(e_{max} - e)/(e_{max} - e_{min})$

(c) *Permeability*

h	hydraulic head or potential
q	rate of discharge
v	velocity of flow
i	hydraulic gradient
κ	coefficient of permeability
j	seepage force per unit volume

(d) *Consolidation (one-dimensional)*

m_v	coefficient of volume change = $-\Delta e/(1+e)\Delta\sigma'$
C_c	compression index = $-\Delta e/\Delta\log_{10}\sigma'$
c_v	coefficient of consolidation
T_F	time factor = $c_v t/d^2$ (d, drainage path)
U	degree of consolidation

(e) *Shear strength*

τ_f	shear strength	in terms of effective stress $\tau_f = c'+\sigma'\tan\phi$
c'	effective cohesion intercept	
ϕ'	effective angle of shearing resistance, or friction	
S_u	apparent cohesion*	in terms of total stress $\tau_f = cu+\sigma\tan\phi_u$
ϕ_u	apparent angle of shearing resistance, or friction	
μ	coefficient of friction	
S_t	sensitivity	

*For the case of a saturated cohesive soil, $\phi_u = 0$ and the undrained shear strength $\tau_f = S_u$ is taken as half the undrained compressive strength.

Golder Associates
London, Ontario

RECORD OF BOREHOLE No 1

1 OF 1

METRIC

PROJECT 04-1130 054-0-0
G.W.P. 62-00-00
DIST 1 HWY 401
DATUM GEODETIC
LOCATION N 4677770.8 ;E 273961.5
BOREHOLE TYPE POWER AUGER (HOLLOW STEM)
DATE 5 August 2004
ORIGINATED BY MR
COMPILED BY BG
CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
188.98	GROUND SURFACE										
0.00 / 188.58	(FILL), sand and gravel, crushed Grey										
0.40 / 188.25	(FILL), sand, trace gravel, trace silt, Brown										
0.73 / 187.61	(FILL), silty clay, trace sand, trace gravel, Very stiff, Brown and grey		1	SS	29		188		○		
1.37 / 187.15	(FILL), silty sand, some gravel, trace clay, Compact, Brown		2	SS	16				○		
1.83	(FILL), silty clay, trace sand, trace gravel, Very stiff to hard, Brown and grey		3	SS	37		187		○		1 21 48 30
185.32			4	SS	19		186		○ —		
3.66 / 184.56	SILTY CLAY, trace sand, trace gravel Stiff, Mottled brown and grey		5	SS	12		185		○		
4.42 / 183.80	SILTY CLAY, trace sand, trace gravel, with cobbles (TILL) Hard, Brown		6	SS	51		184		○		
5.18	SILTY CLAY, trace sand, trace gravel (TILL) Hard to very stiff, Grey		7	SS	58		183		○		
			8	SS	29		182		○		
180.90			9	SS	18		181		○		
8.08	**END OF BOREHOLE** Borehole dry during drilling Aug. 5, 2004										

+ ³, × ³: Numbers refer to Sensitivity ○ ³% STRAIN AT FAILURE

ON_MTO 04-1130 054.GPJ ON_MOT.GDT 24/12/04

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London, Ontario

RECORD OF BOREHOLE No 2

1 OF 1

METRIC

PROJECT 04-1130 054-0-0
G.W.P. 62-00-00
DIST 1 HWY 401
DATUM GEODETIC

LOCATION N 4677923.7 ;E 273959.1
BOREHOLE TYPE POWER AUGER (HOLLOW STEM)
DATE 5 August 2004

ORIGINATED BY MR
COMPILED BY BG
CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
192.19	GROUND SURFACE						192				
0.00	ASPHALT										
0.21	(FILL), sand and gravel, crushed, Grey										
0.40	(FILL), sand, trace gravel, trace silt, Brown										
0.61	(FILL), silty clay, trace sand, trace gravel, Stiff to very stiff, Brown and grey		1	SS	13						
			2	SS	9		191				
			3	SS	20		190	(>144)			
			4	SS	19		189				
			5	SS	21						
			6	SS	16		188				
185.94											
6.25	(FILL), sand and gravel, some silt, trace topsoil, Compact, Brown		7	SS	27		187				
185.48											
6.71	TOPSOIL, clayey, Very stiff, Black		8	SS	19		186				
185.18											
7.01	SILTY CLAY, trace sand, trace gravel Very stiff to stiff, Mottled brown and grey		9	SS	14		185				
183.66											
8.53	SILTY CLAY, trace sand, trace gravel (TILL) Hard, Brown		10	SS	43		184				
182.13							183				
10.06	SILTY CLAY, trace sand, trace gravel (TILL) Very stiff, Grey		11	SS	19		182				
181.06											
11.13	END OF BOREHOLE Borehole dry during drilling Aug. 5, 2004										

$+^3, \times^3$: Numbers refer to Sensitivity $\circ^{3\%}$ STRAIN AT FAILURE

Golder Associates
London, Ontario

RECORD OF BOREHOLE No 3

1 OF 1

METRIC

PROJECT 04-1130 054-0-0
G.W.P. 62-00-00
DIST 1 HWY 401
DATUM GEODETIC

LOCATION N 4678029.1 ;E 273973.2
BOREHOLE TYPE POWER AUGER (HOLLOW STEM)
DATE 5 August 2004

ORIGINATED BY MR
COMPILED BY BG
CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
192.14	PAVEMENT SURFACE						192				
0.00	ASPHALT										
0.21	(FILL), sand and gravel, crushed, Grey										
0.40 / 191.44	(FILL), sand, trace gravel, trace silt, Brown										
0.70	(FILL), silty clay, trace sand, trace gravel, Stiff to very stiff, Brown and grey		1	SS	14				○		
			2	SS	16		191		○		
190.01											
2.13	(FILL), silty clay, trace sand, trace gravel, trace topsoil, Very stiff, Brown and grey		3	SS	15				○		
189.24							190				
2.90	(FILL), silty clay, trace sand, trace gravel, Very stiff to hard Brown and grey		4	SS	21				○		
			5	SS	15		189		○		
			6	SS	16				○		
185.74			7	SS	53		188		○		
6.40 / 185.43	(FILL), silty sand, some gravel, trace topsoil, Very dense, Brown										
6.71	SILTY CLAY, trace sand, trace gravel (TILL) Very stiff to stiff, Mottled brown and grey		8	SS	22		187		○		3 21 42 34
			9	SS	12		186		○	40	
183.61											
8.53	SILTY CLAY, trace sand, trace gravel (TILL) Hard, Brown		10	SS	68		185		○		
182.08							184				
10.06	SILTY CLAY, trace sand, trace gravel (TILL) Very stiff, Grey		11	SS	21		183		○		
181.01							182				
11.13	END OF BOREHOLE Borehole dry during drilling Aug. 5, 2004										

$+^3, \times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

ON_MTO 04-1130 054.GPJ ON_MOT.GDT 24/12/04

Golder Associates
London, Ontario

RECORD OF BOREHOLE No 4

1 OF 1

METRIC

PROJECT 04-1130 054-0-0
G.W.P. 62-00-00
DIST 1 HWY 401
DATUM GEODETIC

LOCATION N 4678189.2 ;E 273953.0
BOREHOLE TYPE POWER AUGER (HOLLOW STEM)
DATE 6 August 2004

ORIGINATED BY MR
COMPILED BY BG
CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
185.60	GROUND SURFACE										
0.06	(FILL), sand and gravel, crushed Grey										
0.21 / 185.08	(FILL), sand and gravel, with silt Brown										
0.52	TOPSOIL, clayey, Black										
	SILTY CLAY, trace sand, trace gravel, with cobbles, trace topsoil		1	SS	13						
184.23											
1.37	Stiff, Mottled brown and grey		2	SS	6	▽	184				
	SILTY CLAY, trace sand, trace gravel,										
183.31	Firm, Mottled brown and grey										
2.29	SILTY CLAY, trace sand, trace gravel (TILL), Hard, Brown and grey		3	SS	34		183	(>144)			
			4	SS	31						
181.94							182				
3.66	SILTY CLAY, trace sand, trace gravel (TILL) Very stiff to stiff, Grey		5	SS	21						
			6	SS	16		181				
			7	SS	16		180				
			8	SS	14		179				
			9	SS	16		178				
177.52											
8.08	END OF BOREHOLE Groundwater encountered in borehole at 2.13m depth during drilling Aug. 6, 2004										

$+^3, \times^3$: Numbers refer to Sensitivity

$\circ^{3\%}$ STRAIN AT FAILURE

ON_MTO 04-1130 054.GPJ ON_MOT.GDT 24/12/04

Golder Associates
London, Ontario

RECORD OF BOREHOLE No 5

1 OF 1

METRIC

PROJECT 04-1130 054-0-0
G.W.P. 62-00-00
DIST 1 HWY 401
DATUM GEODETIC
LOCATION N 4678087.9 ;E 273940.8
BOREHOLE TYPE POWER AUGER (HOLLOW STEM)
DATE 6 August 2004
ORIGINATED BY MR
COMPILED BY BG
CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
185.68	GROUND SURFACE										
0.00	(FILL), sand and gravel, crushed Grey										
0.24	(FILL), sand and gravel Brown										
0.40	TOPSOIL, clayey, Black										
	SILTY CLAY, trace sand, trace gravel,		1	SS	13		185				
184.31	Stiff, Mottled brown and grey										
1.37	SILTY CLAY, trace sand, trace gravel (TILL),		2	SS	18		184				
183.55	Very stiff, Brown and grey										
2.13	CLAYEY SILT, trace sand, trace gravel (TILL),		3	SS	55		183				
183.09	Hard, Brown										
2.59	SILT, trace fine sand, Very dense, Brown		4	SS	46						
182.78	SILTY CLAY, trace sand, trace gravel (TILL) Hard to stiff, Grey						182				
2.90			5	SS	24						
			6	SS	16		181				
			7	SS	16		180				2 23 46 31
			8	SS	13						
							179				
177.60			9	SS	12		178				
8.08	END OF BOREHOLE Borehole dry during drilling Aug. 6, 2004										

$+^{3}, \times^{3}$: Numbers refer to Sensitivity $\circ^{3\%}$ STRAIN AT FAILURE

Golder Associates
London, Ontario

RECORD OF BOREHOLE No 6

1 OF 1 **METRIC**

PROJECT 04-1130 054-0-0 | LOCATION N 4678138.6 ;E 273989.6 | ORIGINATED BY MA

G.W.P. 62-00-00 | BOREHOLE TYPE POWER AUGER (HOLLOW STEM) | COMPILED BY BG

DIST 1 HWY 401 | DATUM GEODETIC | DATE 24 August 2004 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
185.56	GROUND SURFACE										
0.00	TOPSOIL, clayey Brown										
0.24	SILTY CLAY, trace sand, trace gravel (TILL) Firm to hard, Mottled brown & grey becoming brown at 1.4m and grey at 2.7m depth		1	SS	10		185				
			2	SS	22		184				
			3	SS	32		183				
			4	SS	16		182				
			5	SS	16						
			6	SS	9		181				2 23 46 31
			7	SS	10		180				
			8	SS	8		179				
176.72			9	SS	12		178				
8.84	END OF BOREHOLE Borehole dry during drilling Aug. 24, 2004						177				

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

ON_MTO 04-1130 054.GPJ ON_MOT.GDT 24/12/04

Golder Associates
London, Ontario

RECORD OF BOREHOLE No 7

1 OF 1 **METRIC**

PROJECT 04-1130 054-0-0 | G.W.P. 62-00-00 | DIST 1 | HWY 401 | DATUM GEODETIC

LOCATION N 4677873.0 ;E 273940.5 | BOREHOLE TYPE POWER AUGER (HOLLOW STEM) | DATE 24 August 2004

ORIGINATED BY MA | COMPILED BY BG | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
185.63	GROUND SURFACE										
0.00	TOPSOIL, clayey Brown										
0.24 / 185.02	(FILL), silty clay, trace sand, trace gravel, Brown										
0.61	SILTY CLAY, trace sand, trace gravel (TILL) Firm to hard, Mottled brown & grey becoming brown at 1.4m and grey at 2.9m depth		1	SS	7		185				
			2	SS	31		184				
			3	SS	31		183				
			4	SS	21		182				
			5	SS	14		181				
			6	SS	10		180				
			7	SS	5		179	(>144) (>144)			21 48 31
			8	SS	7		178				
176.79			9	SS	16		177				
8.84	END OF BOREHOLE Borehole dry during drilling Aug. 24, 2004										

+ 3, × 3, Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Golder Associates
London, Ontario

RECORD OF BOREHOLE No 8

1 OF 1 **METRIC**

PROJECT 04-1130 054-0-0 | LOCATION N 4677825.1 ;E 273941.5 | ORIGINATED BY MA

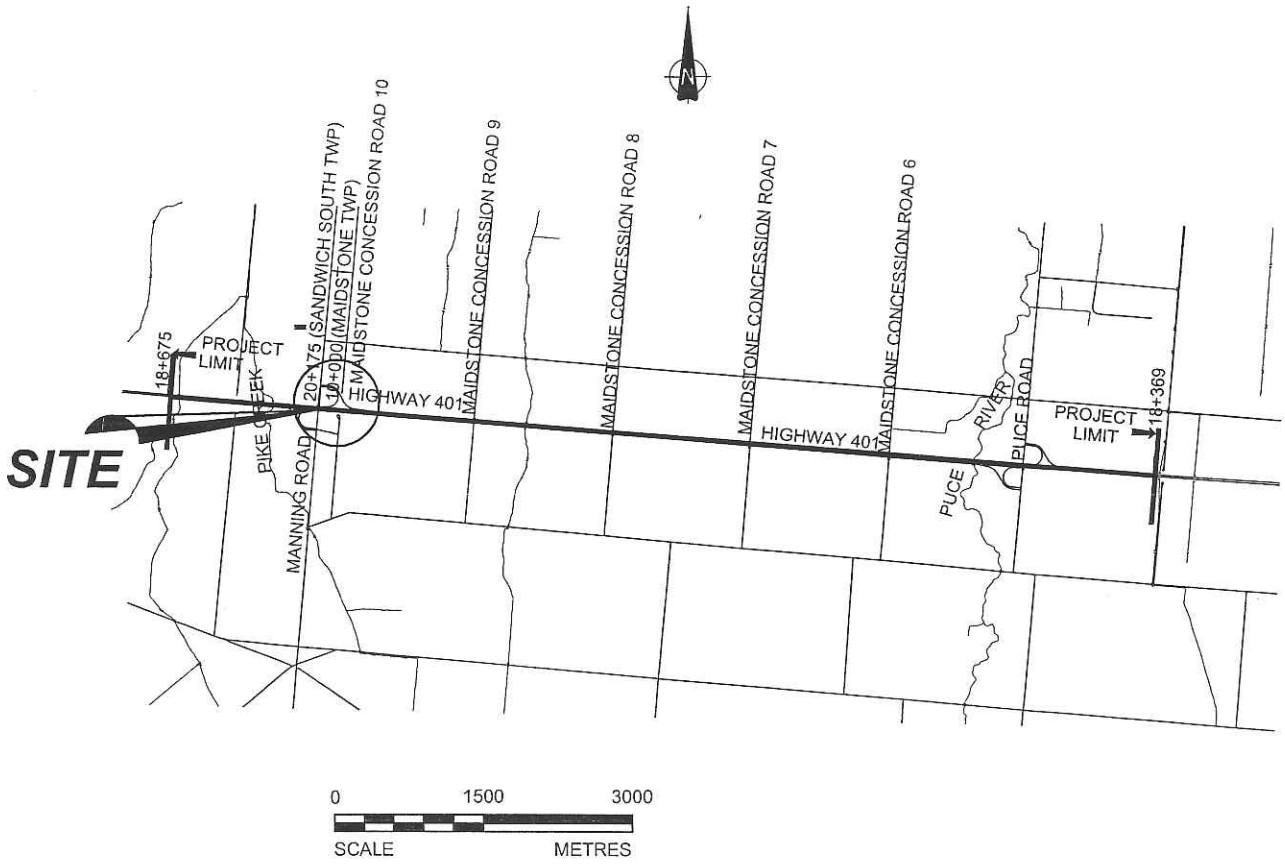
G.W.P. 62-00-00 | BOREHOLE TYPE POWER AUGER (HOLLOW STEM) | COMPILED BY BG

DIST 1 HWY 401 | DATUM GEODETIC | DATE 24 August 2004 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
185.60	GROUND SURFACE										
0.00	TOPSOIL, clayey										
0.15	Brown SILTY CLAY, trace sand, trace gravel (TILL), Firm to very stiff, Mottled brown & grey becoming brown at 1.4m and grey at 2.6m depth		1	SS	12		185				
			2	SS	21		184				
			3	SS	30		183				
			4	SS	16		182				
			5	SS	10						
			6	SS	8		181				
							180	(>144) (>144)			
			7	SS	7		179	1.6 (>144)			21 48 31
			8	SS	7		178				
176.76			9	SS	13		177				
8.84	END OF BOREHOLE Borehole dry during drilling Aug. 24, 2004										

+³, ×³: Numbers refer to Sensitivity ○³% STRAIN AT FAILURE

ON_MTO 04-1130 054.GPJ ON_MOT.GDT 24/12/04



PROJECT

GWP 62-00-00
HIGHWAY 401

TITLE

KEY PLAN

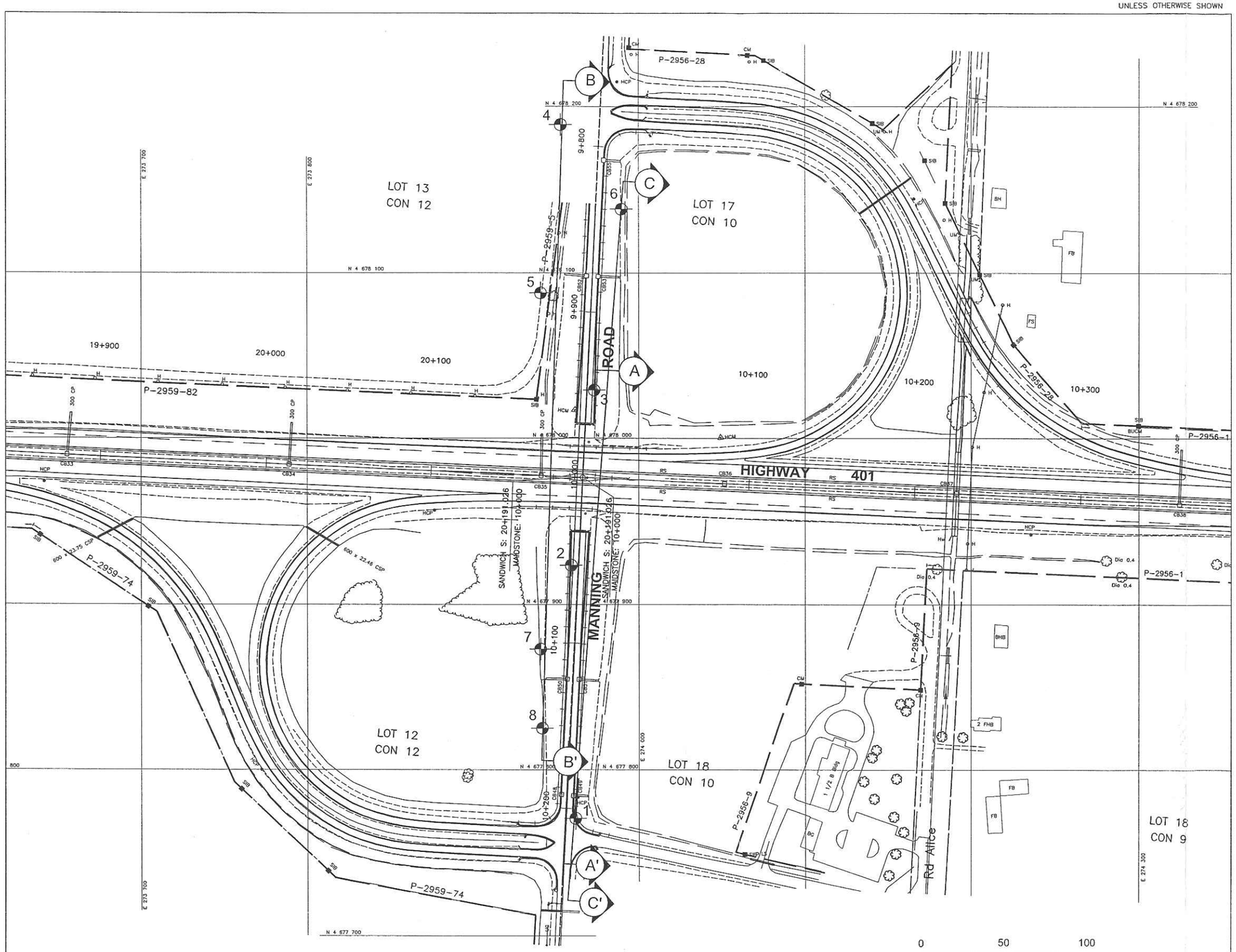
Golder Associates
LONDON, ONTARIO

PROJECT No.		041-130054	FILE No.	041-130054D001
			SCALE AS SHOWN	REV. 0
CADD	BG	DEC. 04		
CHECK	MEB	DEC. 04		

FIGURE 1

Drawing file: 041-130054-1-001.dwg Dec 22, 2004 - 3:48pm

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



DIST	HWY. 401
CONT. No.	
WP No. 62-00-00	

MANNING ROAD

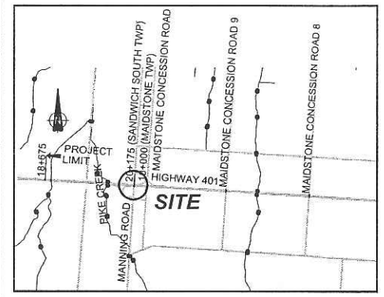
BOREHOLE LOCATIONS & SOIL STRATA

SHEET

Golder Associates

Golder Associates Ltd.
LONDON, ONTARIO, CANADA

REFERENCE
DRAWING SUPPLIED BY ONTARIO MINISTRY OF TRANSPORTATION
ENTITLED: SOUTHWEST REGION
HWY 401 AND MANNING ROAD, GENERAL ARRANGEMENT
GWP - 62-00-00



KEY PLAN

LEGEND

- Borehole
- Seal
- Piezometer
- N — Blows/0.3m (Std. Pen. Test, 475 j/blow)
- WL in piezometer
- WL during drilling

No.	ELEVATION (metres)	CO-ORDINATES NORTH	CO-ORDINATES EAST
1	188.98	4677770.8	273961.5
2	192.19	4677923.7	273959.1
3	192.14	4678029.1	273973.2
4	185.60	4678189.2	273953.0
5	185.68	4678087.9	273940.8
6	185.56	4678138.6	273989.6
7	185.63	4677873.0	273940.5
8	185.60	4677825.1	273941.5

NOTES
The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

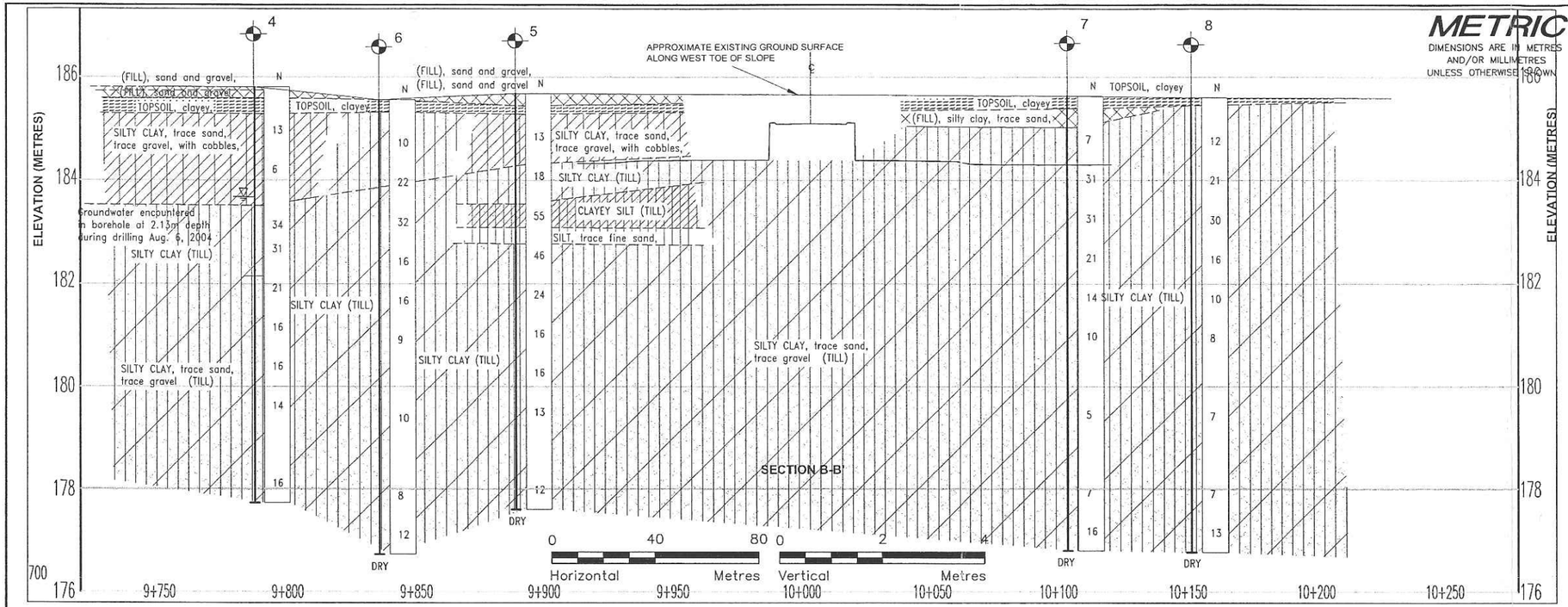
NO.	DATE	BY	REVISION

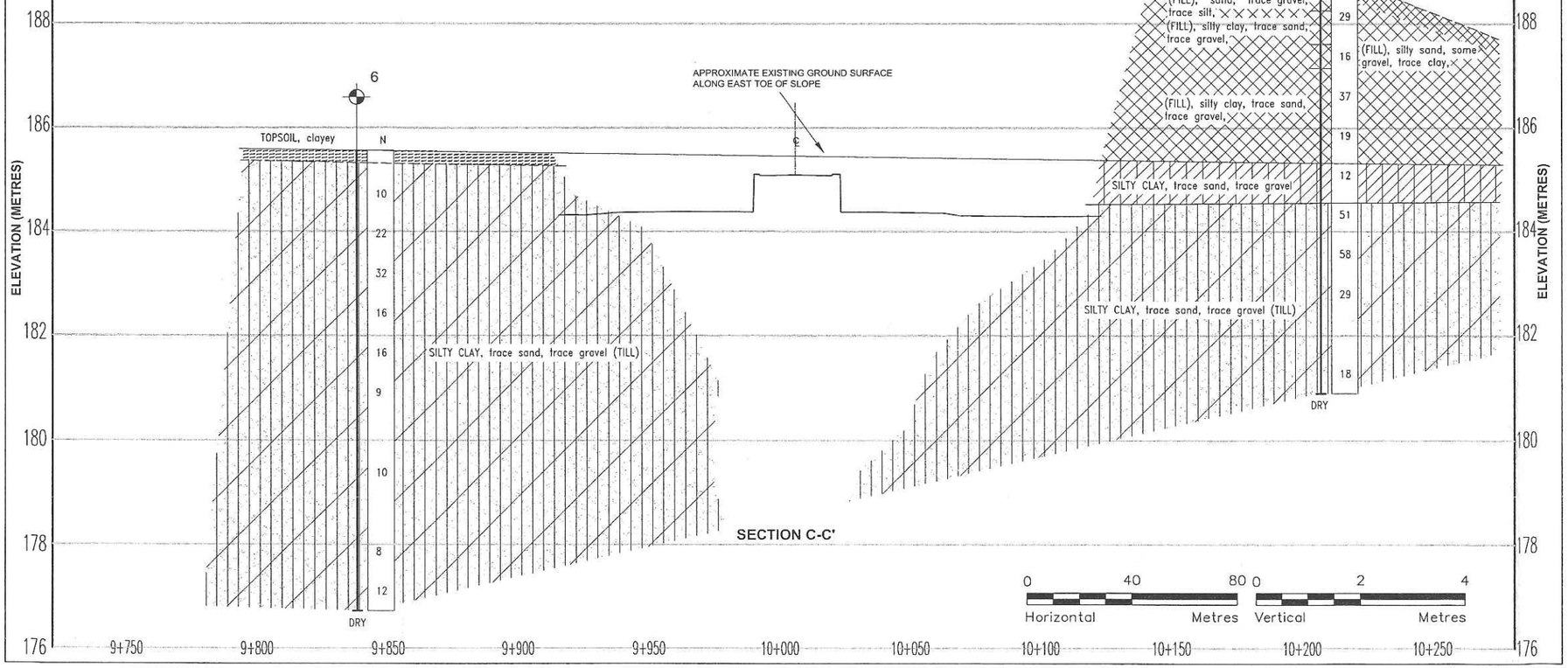
Geocres No. 40J2-61

HWY. No. 401		PROJECT NO.: 041130054-0-0		
SUBM'D. –	CHKD: –	DATE: DEC. 2004		
DRAWN: BG	CHKD. AMH	APPD.	DWG. 1	

0013225D001.DWG

D [illegible] 22" x 11" [illegible] half [illegible]
1 me[illegible]





DIST HWY. 401
CONT. No.
WP No. 62-00-00

MANNING ROAD

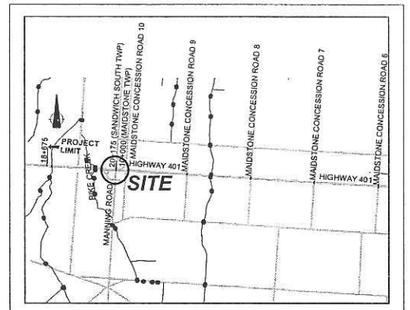
BOREHOLE LOCATIONS & SOIL STRATA

SHEET

Golder Associates

Golder Associates Ltd.
LONDON, ONTARIO, CANADA

REFERENCE
DRAWING SUPPLIED BY ONTARIO MINISTRY OF TRANSPORTATION
ENTITLED: SOUTHWEST REGION
HWY 401 AND MANNING ROAD, GENERAL ARRANGEMENT
GWP - 62-00-00



KEY PLAN

LEGEND

- Borehole
- Seal
- Piezometer
- N — Blows/0.3m (Std. Pen. Test, 475 j/blow)
- WL in piezometer
- WL during drilling
- DRY — Dry during drilling

No.	ELEVATION (metres)	CO-ORDINATES NORTH	CO-ORDINATES EAST
4	185.60	4678189.2	273953.0
5	185.68	4678087.9	273940.8
6	185.56	4678138.6	273989.6
7	185.63	4677873.0	273940.5
8	185.60	4677825.1	273941.5

NOTES
The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

NO.	DATE	BY	REVISION

Geocres No. 40J2-61

HWY. No. 401		PROJECT NO. 041-130054-0-0			
SUBM'D. –		CHKD: –	DATE: DEC. 2004		
DRAWN: BG		CHKD. AMH	APPD.	DWG.	3

0013225D001.DWG

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

DIST HWY. 401
CONT. No.
WP No. 62-00-00

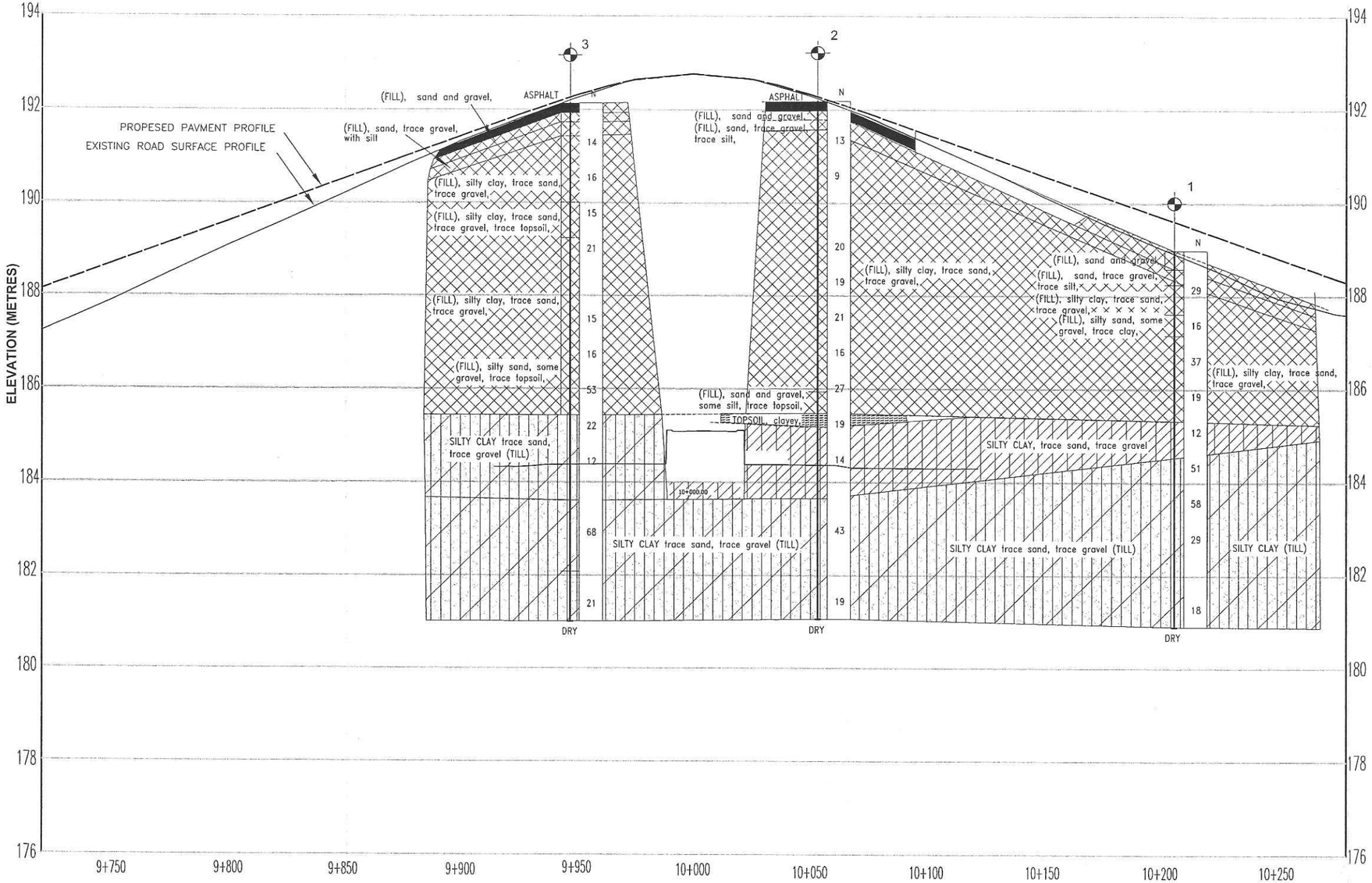
MANNING ROAD

BOREHOLE LOCATIONS & SOIL STRATA

SHEET

Golder Associates

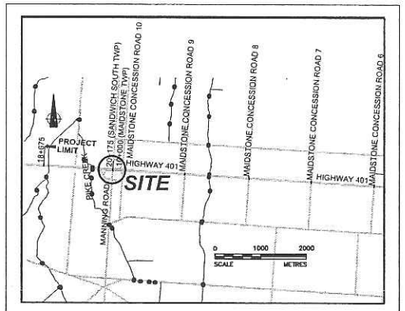
Golder Associates Ltd.
LONDON, ONTARIO, CANADA



PROFILE ALONG C/L OF MANNING ROAD A-A'

0 40 80
Horizontal METRES

0 2 4
Vertical METRES



KEY PLAN

REFERENCE
DRAWING SUPPLIED BY ONTARIO MINISTRY OF TRANSPORTATION
ENTITLED: SOUTHWEST REGION
HWY 401 AND MANNING ROAD, GENERAL ARRANGEMENT
GWP - 62-00-00

LEGEND

- Borehole
- Seal
- Piezometer
- N — Blows/0.3m (Std. Pen. Test, 475 j/blow)
- WL in piezometer
- WL during drilling
- DRY — Dry during drilling

No.	ELEVATION (metres)	CO-ORDINATES NORTH	CO-ORDINATES EAST
1	188.98	4677770.8	273961.5
2	192.19	4677923.7	273959.1
3	192.14	4678029.1	273973.2

NOTES
The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

NO.	DATE	BY	REVISION

Geocres No. 40J2-61

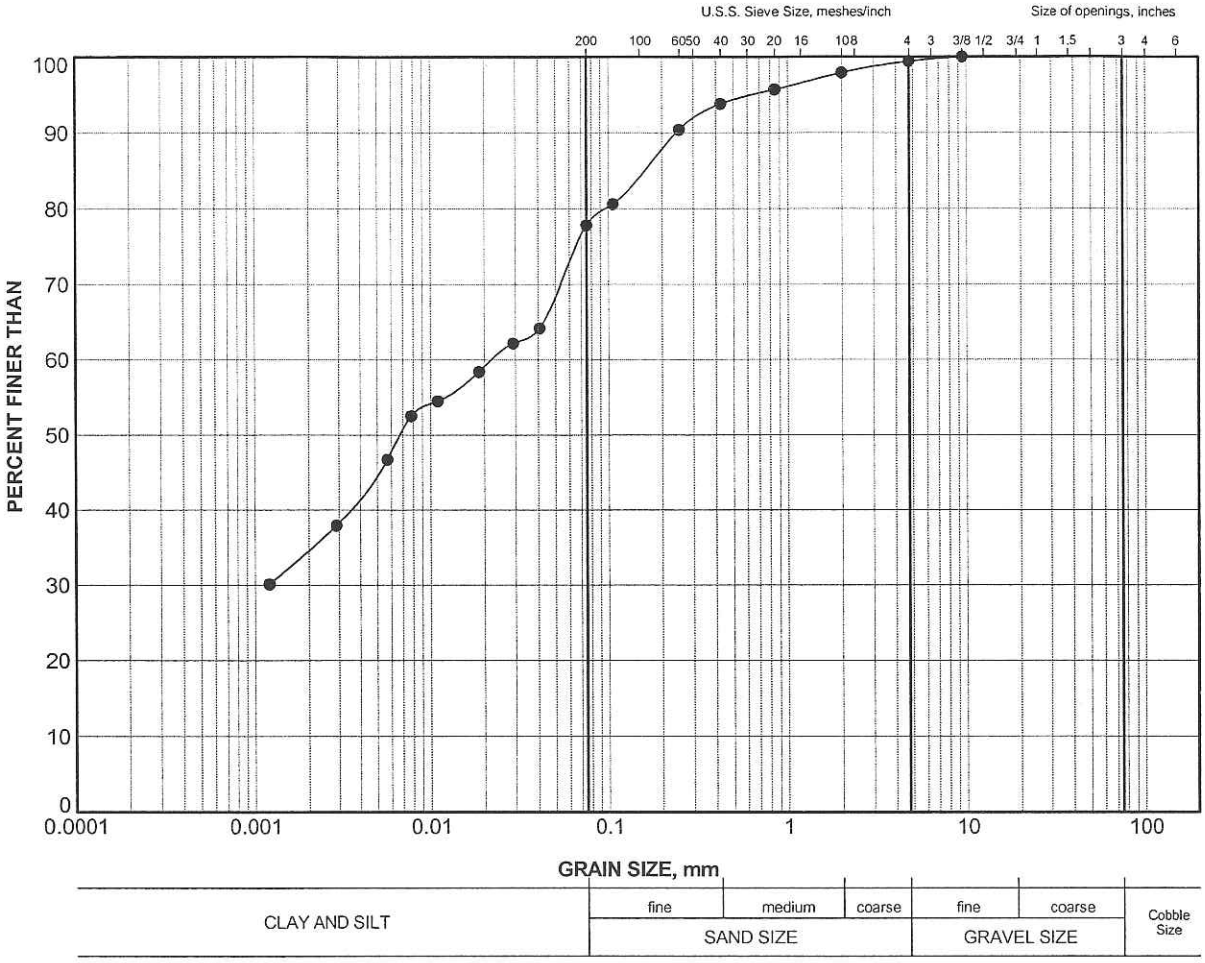
HWY. No. 401		PROJECT NO.:041-130054-0-0		
SUBM'D. –	CHKD: –	DATE: DEC. 2004		
DRAWN: BG	CHKD. AMH	APPD.	DWG. 2	

0013225D001.DWG

D size dwg 22" x 34" 1 metre 11" x ... print half scale

APPENDIX A

LABORATORY TEST DATA



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	1	3	186.5

PROJECT

401 AT MANNING ROAD WINDSOR, ONTARIO
GWP 62-00-00

TITLE

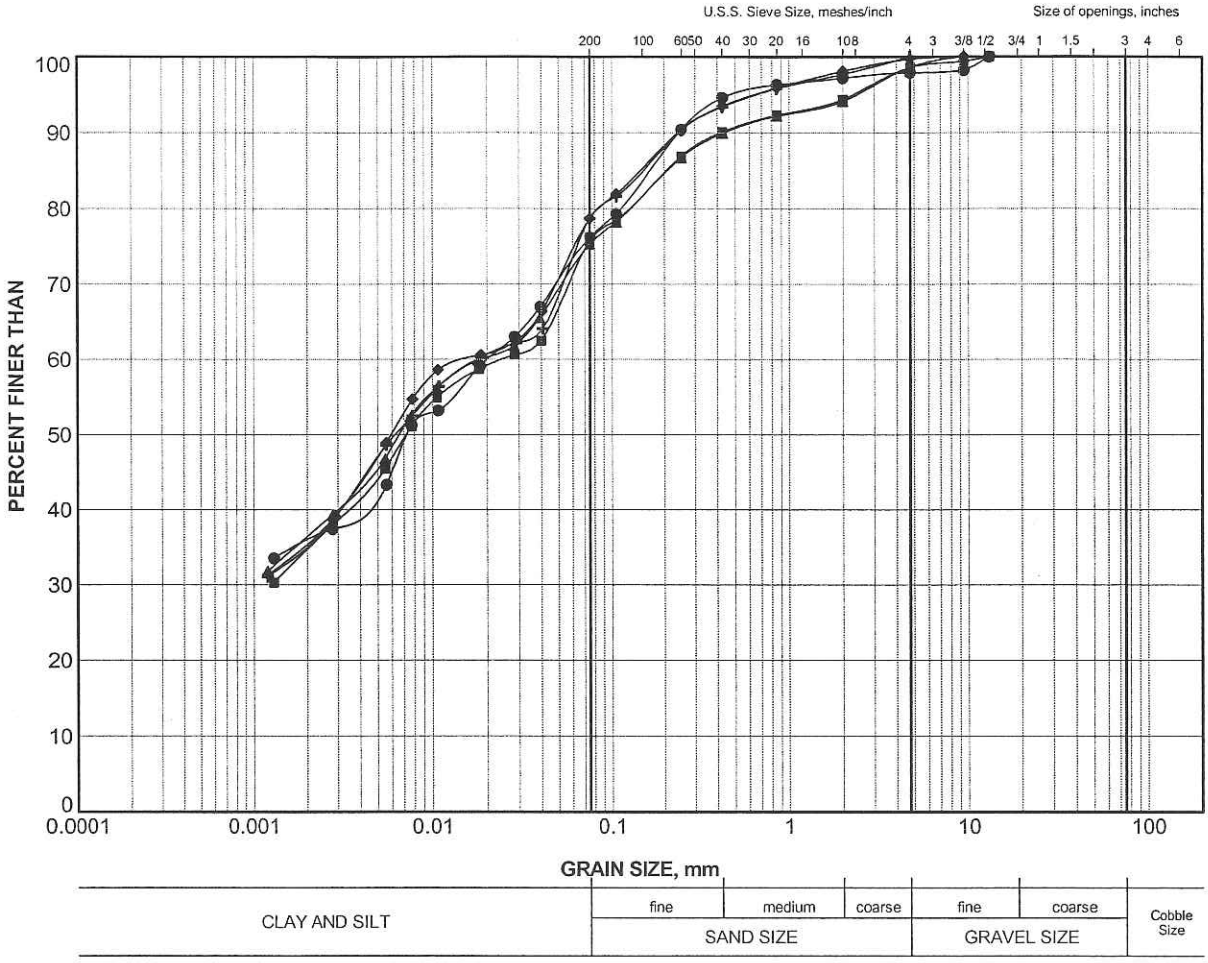
GRAIN SIZE DISTRIBUTION

(FILL)

Golder Associates
LONDON, ONTARIO

PROJECT No. 04-1130 054-0-0			FILE No. 04-1130 054-0-0.GPJ	
			SCALE N/A	REV.
DRAWN	BG	Sep 17/04	FIGURE A-1	
CHECK	MEB	Dec. 24/04		

LDN_MTO_NEW GLDR_LDN.GDT



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	3	8	185.0
■	5	7	180.2
▲	6	6	180.8
+	7	7	179.3
◆	8	7	179.3

PROJECT

401 AT MANNING ROAD WINDSOR, ONTARIO
GWP 62-00-00

TITLE

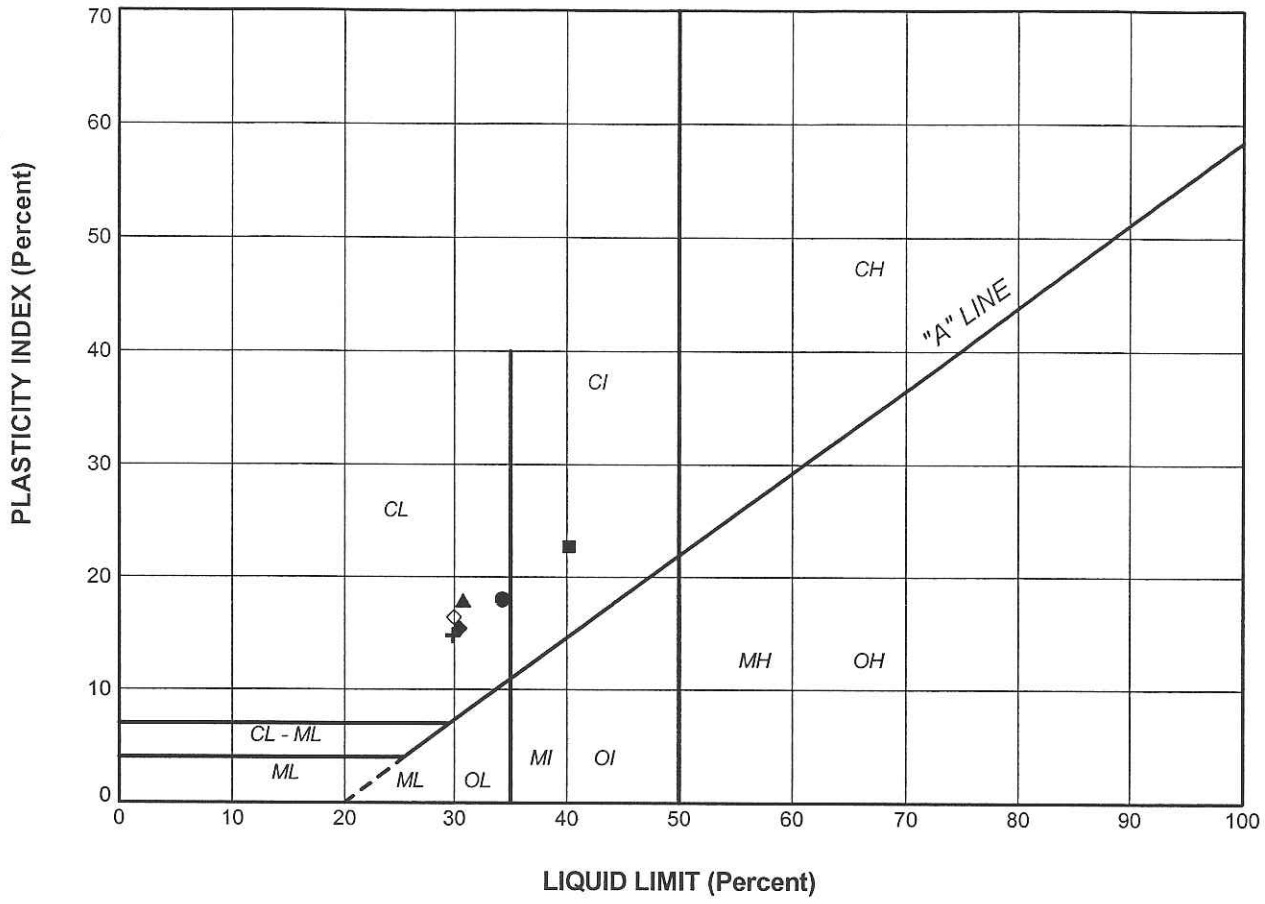
GRAIN SIZE DISTRIBUTION

Silty Clay Till

Golder Associates
LONDON, ONTARIO

PROJECT No.	04-1130 054-0-0		FILE No.	04-1130 054-0-0.GPJ
			SCALE	N/A REV.
DRAWN	BG	Sep 17/04		
CHECK	MEB	Dec. 24/04		FIGURE A-2

LDN_MTO_NEW GLDR_LDN.GDT



SOIL TYPE
C = Clay
M = Silt
O = Organic

PLASTICITY
L = Low
I = Intermediate
H = High

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)	LL(%)	PL(%)	PI
●	1	4	185.9	34.3	16.3	18.0
■	3	9	184.5	40.2	17.5	22.7
▲	5	6	181.1	30.8	12.9	17.9
+	6	5	181.8	29.9	15.1	14.8
◆	7	8	178.0	30.5	15.1	15.4
◇	8	6	181.0	30.0	13.6	16.4

PROJECT

401 AT MANNING ROAD WINDSOR, ONTARIO
GWP 62-00-00

TITLE

PLASTICITY CHART
(Silty Clay Till)

Golder Associates
LONDON, ONTARIO

PROJECT No.	04-1130 054-0-0		FILE No.	04-1130 054-0-0.GPJ
			SCALE	N/A REV.
DRAWN	BG	Sep 17/04		
CHECK	MEB	Dec. 24/04		FIGURE A-3

MTO_PI_GLDR_LDN.GDT