

N 4678476.225  
E 265889.519

**METRIC**

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

CONT No 2007-3043

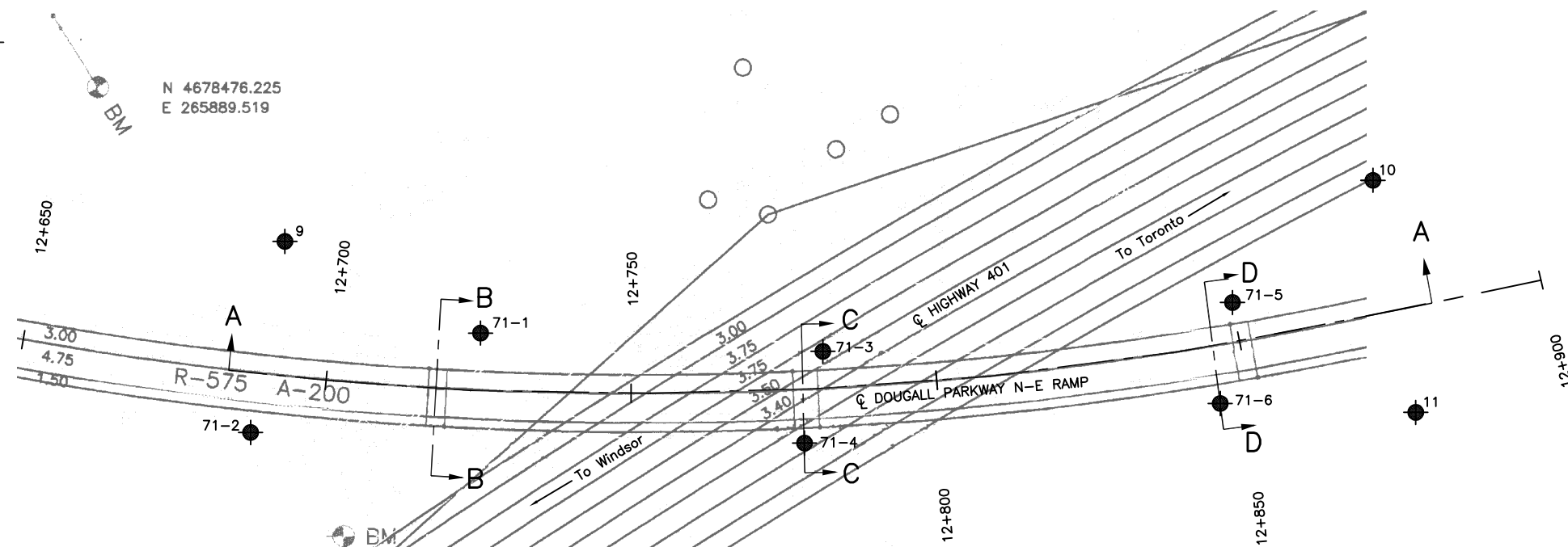
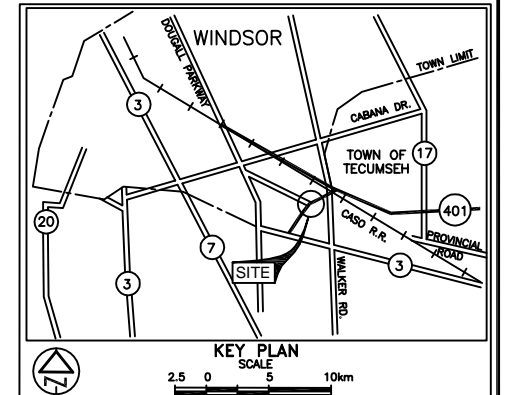
WP No 64-00-02

HIGHWAY 401  
DOUGALL PARKWAY UNDERPASS  
BOREHOLE LOCATIONS & SOIL STRATA



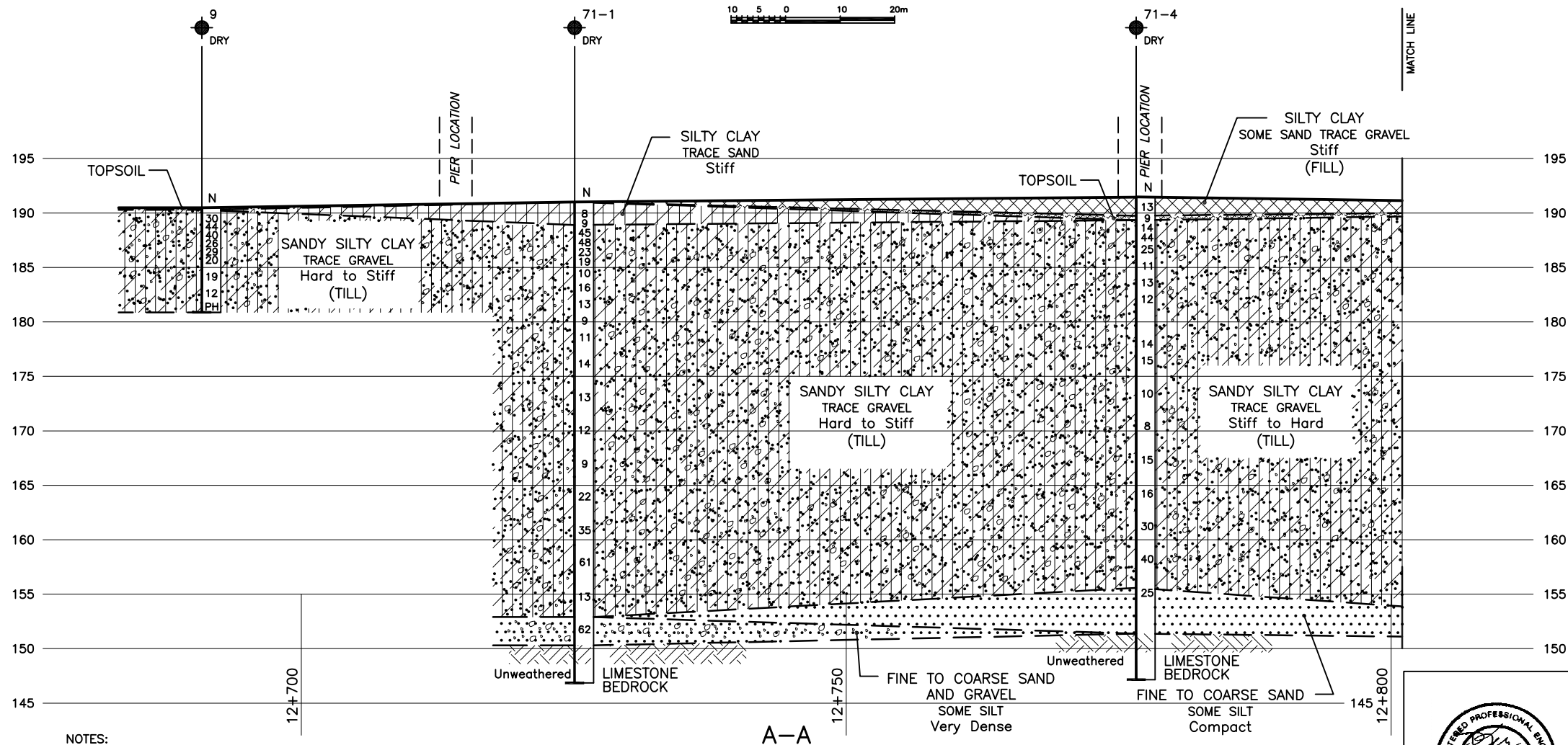
SHEET  
432

**PML Peto MacCallum Ltd.**  
CONSULTING ENGINEER



PLAN

SCALE



A-A

SECTION

SCALE



NOTES:

- REFER TO DRAWING 2 FOR SECTION A-A CONTINUED, SECTIONS B-B, C-C, AND D-D.
- SECTIONS ARE PROVIDED SOLELY FOR ILLUSTRATIVE PURPOSES. REFER TO RECORD OF BOREHOLES FOR DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS, IN-SITU TEST DATA AND LABORATORY TEST RESULTS.

REF No Survey Plan 2001 Site # 6-71, entitled Proposed Bridge Site at Tunnel Diversion and Highway 401, Prepared by Planning and Design Section, MTO.



LEGEND

- Borehole
- Dynamic Cone Penetration Test (Cone)
- Borehole & Cone
- N Blows/0.3m (Std. Pen Test, 475 J / blow)
- CONE Blows/0.3m (60° Cone, 475 J / blow)
- W L at time of investigation Jan - Mar 2002
- Head
- ARTESIAN WATER
- Encountered
- PIEZOMETER

BH No	ELEVATION	N-E RAMP STA.	o/s Lt. EP
71-1	191.00	12+725	9.5m Lt.
71-2	191.38	12+688	9.8m Rt.
71-3	191.47	12+782	6.0m Lt.
71-4	191.46	12+778	8.9m Rt.
71-5	190.49	12+850	6.3m Lt.
71-6	191.65	12+845	8.8m Rt.
9	190.48	12+691	21.9m Lt.
10	190.32	12+877	21.6m Lt.
11	190.56	12+876	17.0m Rt.

NOTE

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

REVISIONS	DATE	BY	DESCRIPTION
MAY 22/07	CN		CHANGED FOR CONTRACT DOCUMENTS AS PER EMAIL DATED APRIL 27, 2007, FROM DILLON CONSULTING LIMITED
FEB.15/07	CN		ADJUSTED BOREHOLES 71-2 AND 71-6 LOCATION AS PER MTO REQUEST

Geocres No. 40J2-48

HWY No	401	DIST	31
SUBM'D	GD	CHECKED	MRA
DATE	SEP 18, 2002	SITE	6-71
DRAWN	MM/NA	CHECKED	BRG
APPROVED	DWK	DWG	2

**METRIC**

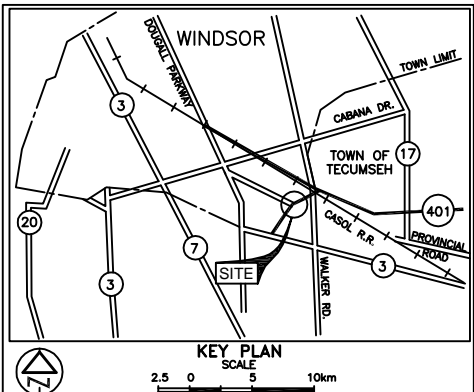
DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES UNLESS  
OTHERWISE SHOWN. STATIONS  
IN KILOMETRES + METRES

CONT No 2007-3043  
WP No 64-00-02

HIGHWAY 401  
DOUGALL PARKWAY UNDERPASS  
SOIL STRATA

SHEET  
433

**PML Peto MacCallum Ltd.**  
CONSULTING ENGINEERS



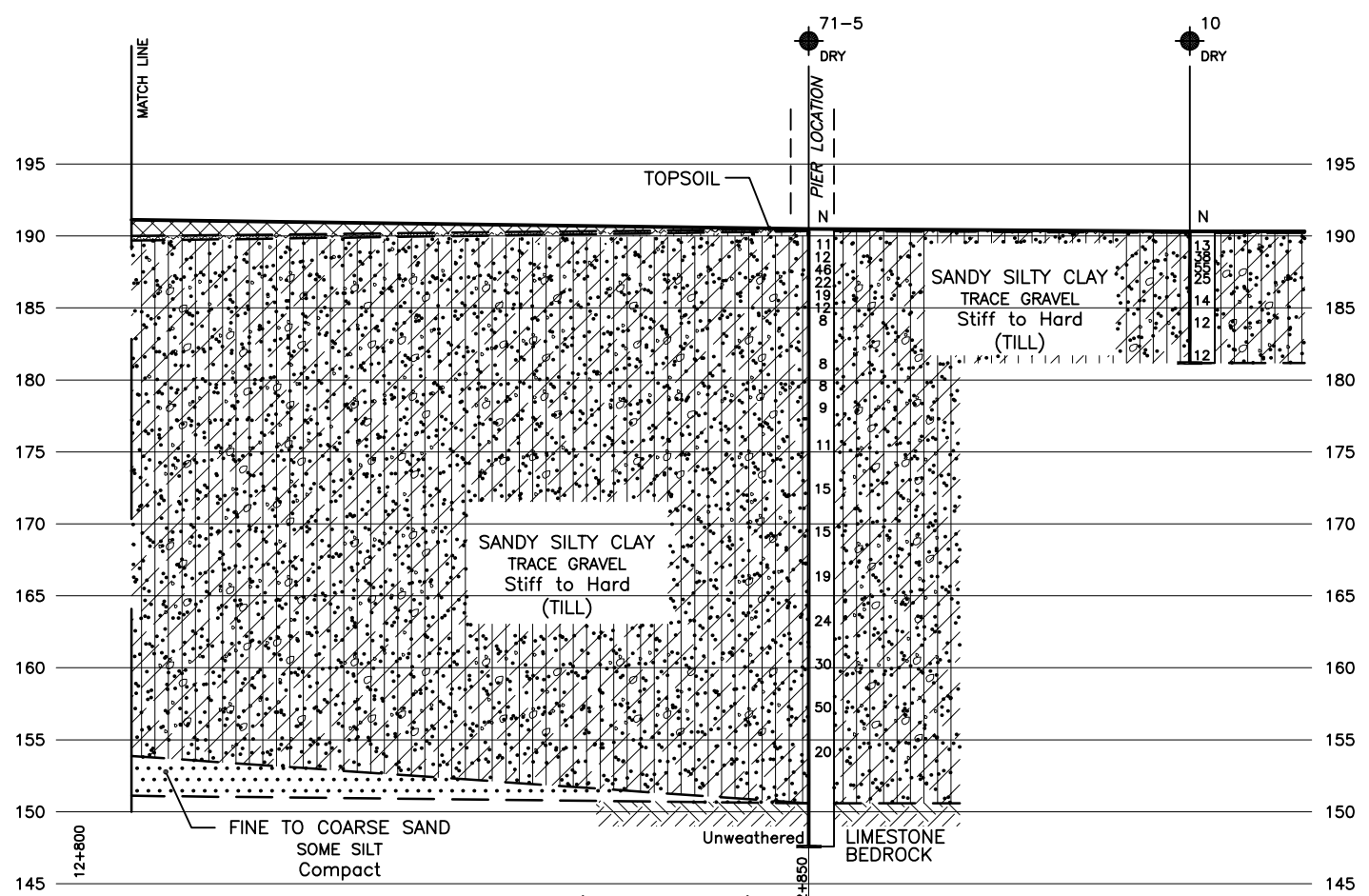
LEGEND			
	Borehole		
	Dynamic Cone Penetration Test (Cone)		
	Borehole & Cone		
N	Blows/0.3m (Std. Pen Test, 475 J / blow)		
CONE	Blows/0.3m (60° Cone, 475 J / blow)		
	W L at time of investigation Jan - Mar 2002		
	Head		
	ARTESIAN WATER Encountered		
	PIEZOMETER		

BH No	ELEVATION	HWY 401 STA.	o/s Lt EP
(Refer to drawing 2 for Stations and Offset)			

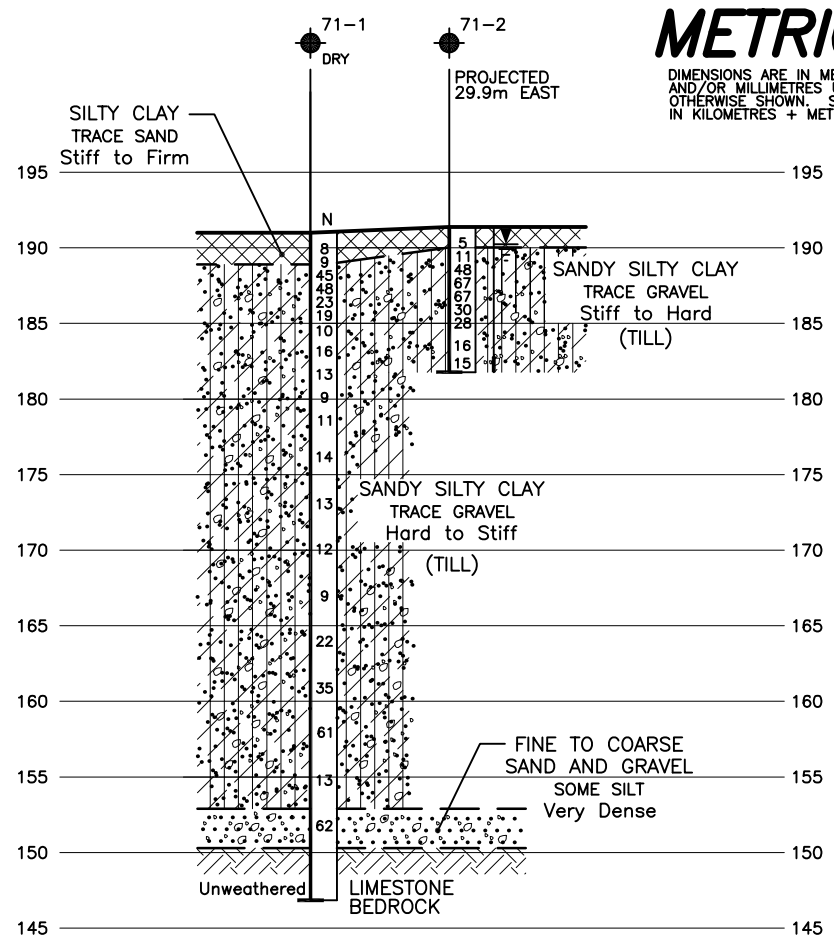
— NOTE —  
The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

REVISIONS	DATE	BY	DESCRIPTION
MAY 22/07	CN		CHANGED FOR CONTRACT DOCUMENTS AS PER EMAIL DATED APRIL 27, 2007, FROM DILLON CONSULTING LIMITED
FEB.15/07	CN		ADJUSTED BOREHOLES 71-2 AND 71-6 LOCATION AS PER MTO REQUEST

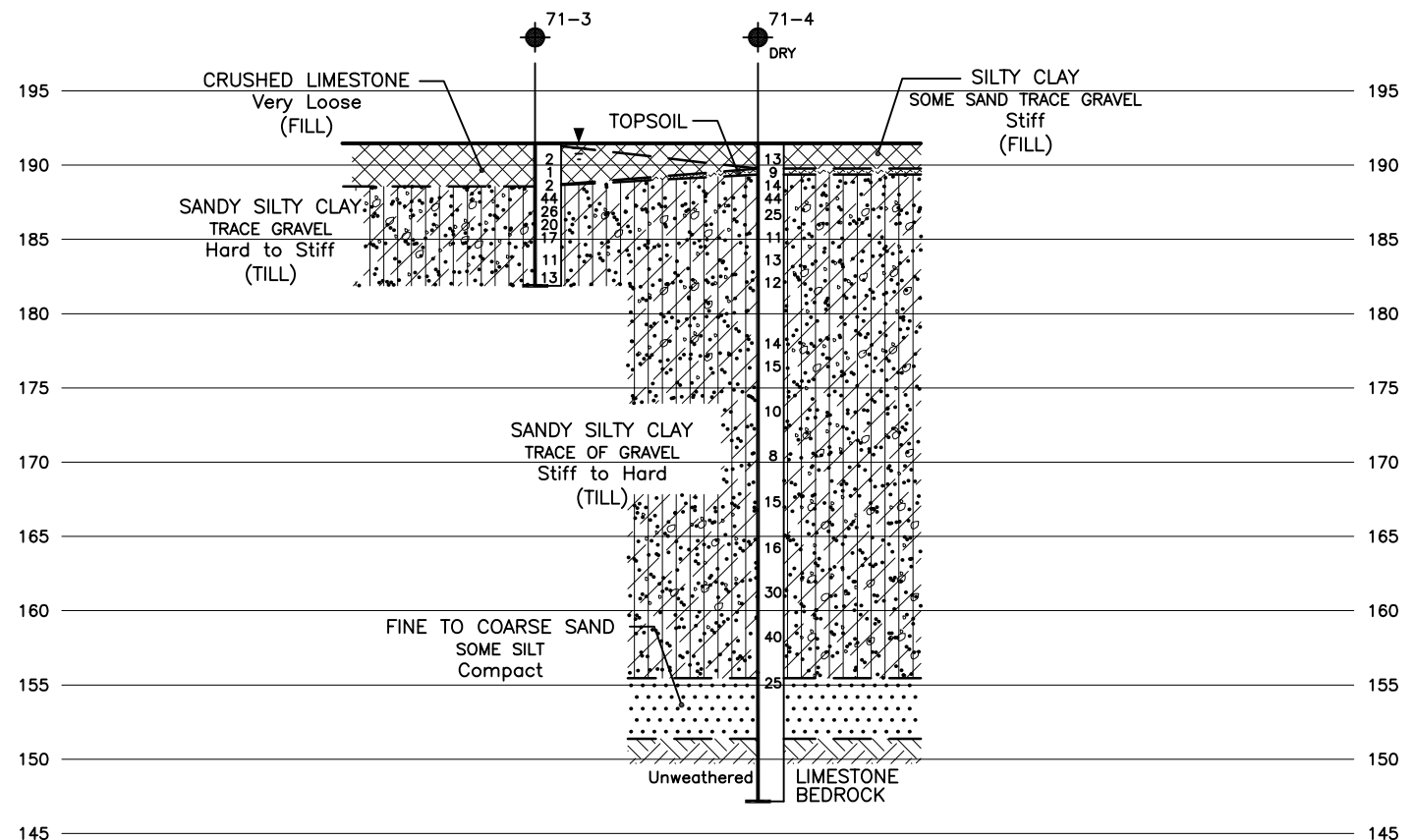
Geocres No. 40J2-48			
HWY No 401		DIST 31	
SUBM'D GD	CHECKED MRA	DATE SEP 18, 2002	SITE 6-71
DRAWN MM/NA	CHECKED DWK	APPROVED BRG	DWG 3



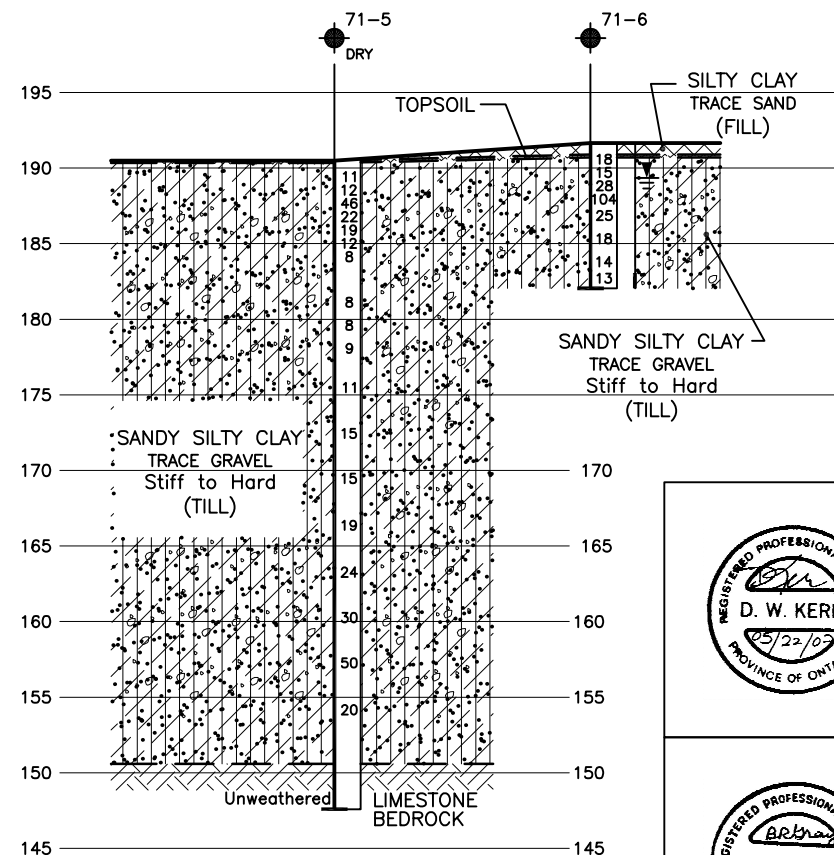
A-A (Continued)



B-B



C-C



D-D

NOTES:

- REFER TO DRAWING 1 FOR PLAN AND SECTION A-A.
- SECTIONS ARE PROVIDED SOLELY FOR ILLUSTRATIVE PURPOSES. REFER TO RECORD OF BOREHOLES FOR DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS, IN-SITU TEST DATA AND LABORATORY TEST RESULTS.

SECTIONS  
SCALE



REF No Survey Plan 2001 Site # 6-71, entitled Proposed Bridge Site at Tunnel Diversion and Highway 401, Prepared by Planning and Design Section, MTO.



RECORD OF BOREHOLE No 71-1

1 of 4

METRIC

W.P. 64-00-02 LOCATION Dougall Parkway, N-E Ramp Sta. 12+725, o/s 9.5m Lt. of Lt. EP ORIGINATED BY MR  
DIST 31 HWY 401 BOREHOLE TYPE C.F.H.S.A., Mud Rotary & NQ Rock Coring COMPILED BY MRA  
DATUM Geodetic DATE January 28 to 30, 2002 CHECKED BY DWK

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE	× LAB VANE						
191.00	Ground Level						20	40	60	80	100						
0.00	Silty clay, trace of sand, with bluish grey fissures Stiff																
	Brown		1	SS	8												
			2	SS	9												
188.90	Sandy silty clay, trace of gravel		3	SS	45												
2.10	(Till)		4	SS	48												
	Hard Brown																
	Very Stiff to Stiff		5	SS	23												
	Grey		6	SS	19												
			7	SS	10												
			8	SS	16												
			9	SS	13												
			10	SS	9												
				FV													
			11	SS	11												
														</			

**METRIC**

**+<sup>7</sup>, ×<sup>5</sup>:** Numbers refer to Sensitivity




(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 71-1

3 of 4

METRIC

W.P. 64-00-02 LOCATION Dougall Parkway, N-E Ramp Sta. 12+725, o/s 9.5m Lt. of Lt. EP ORIGINATED BY MR  
DIST 31 HWY 401 BOREHOLE TYPE C.F.H.S.A., Mud Rotary & NQ Rock Coring COMPILED BY MRA  
DATUM Geodetic DATE January 28 to 30, 2002 CHECKED BY DWK

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			UNIT WEIGHT  γ  kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				w <sub>p</sub>	w	w <sub>L</sub>							
161.00							20	40	60	80	100										
30.00	Sandy silty clay, some gravel  Very Stiff to Hard  Grey  (Till)		17	SS	35																
				18	SS		61														
				19	SS		13														
152.90							153														
38.10	Fine to coarse sand and gravel, some silt  Very Dense  Grey																				
			20	SS	62		152														
							151														
150.30																					
40.70	Bedrock  Unweathered, strong limestone  Grey to Light Grey		21	RC	*		150													* Lost sample	
				22	RC	REC 80%		149													RQD=70%
								148													
			23	RC	REC 90%		147													RQD=50%	
146.85																					
44.15	End of Borehole																				
	Cont'd																				

**RECORD OF BOREHOLE No 71-1**

4 of 4

**METRIC**

W.P. 64-00-02 LOCATION Dougall Parkway, N-E Ramp ORIGINATED BY MR  
DIST 31 HWY 401 BOREHOLE TYPE C.F.H.S.A., Mud Rotary & NQ Rock Coring COMPILED BY MRA  
DATUM Geodetic DATE January 28 to 30, 2002 CHECKED BY DWK

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100	W <sub>p</sub>	W	W <sub>L</sub>		
	Borehole dry on completion of drilling  ■ Penetrometer Test																

RECORD OF BOREHOLE No 71-2

1 of 1

METRIC

W.P. 64-00-02 LOCATION Dougall Parkway, N-E Ramp Sta. 12+688, o/s 9.8m Rt. of Lt. EP ORIGINATED BY MR  
DIST 31 HWY 401 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY MRA  
DATUM Geodetic DATE February 05, 2002 CHECKED BY DWK

SOIL PROFILE				SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE						
191.38 0.00	Ground Level							20	40	60	80	100				
190.03 1.35	Silty clay, some sand Firm Brown (Fill)		1	SS	5											
	Sandy silty clay, trace of gravel (Till)		2	SS	11											
	Stiff to Hard Brown		3	SS	48											
			4	SS	67											
			5	SS	67											
			6	SS	30											
			7	SS	28											
			8	SS	16											
181.78 9.60	End of Borehole		9	SS	15											
<div>■ Penetrometer Test</div> <div>Piezometer Readings: Date      Depth (m) Feb.07/02    6.00 Feb.14/02    3.55 Mar.05/02    1.40 Mar.28/02    1.05 May 06/02    0.85</div> <div>Borehole Backfill Legend: <div><div></div>Native Backfill</div><div><div></div>Bentonite Seal</div><div><div></div>Filter Sand</div></div>																

RECORD OF BOREHOLE No 71-3

1 of 1

METRIC

W.P. 64-00-02 LOCATION Dougall Parkway, N-E Ramp Sta. 12+782, o/s 6.0m Lt. of Lt. EP ORIGINATED BY MR  
DIST 31 HWY 401 BOREHOLE TYPE Continuous Flight Solid and Hollow Stem Augers COMPILED BY MRA  
DATUM Geodetic DATE February 11, 2002 CHECKED BY DWK

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
191.47 0.00	Ground Level					▽*		20	40	60	80	100					
	Crushed limestone						191										* Low N value due to hydraulic disturbance
	Very Loose																
	Saturated																
	(Fill)		1	SS	2*												
			2	SS	1*												
			3	SS	2*												
188.57 2.90	Sandy silty clay, trace of gravel, with oxidized stains		4	SS	44												
	Hard to Stiff		5	SS	26												
	Brown (Till)		6	SS	20												
	Grey		7	SS	17												
			8	SS	11												
			9	SS	13												
181.87 9.60	End of Borehole																
	▽ Groundwater level at surface																
	■ Penetrometer Test																



**METRIC**

**+<sup>7</sup>, ×<sup>5</sup>:** Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 71-4

2 of 4

METRIC

W.P. 64-00-02

LOCATION

Dougall Parkway, N-E Ramp  
Sta. 12+778, o/s 8.9m Rt. of Lt. EP

ORIGINATED BY MR

DIST 31 HWY 401

BOREHOLE TYPE

C.F.H.S.A., Mud Rotary & NQ Rock Coring

COMPILED BY MRA

DATUM Geodetic

DATE \_\_\_\_\_

February 05, 2002

CHECKED BY DWK

[illegible]

RECORD OF BOREHOLE No 71-4

3 of 4

METRIC

W.P. 64-00-02 LOCATION Dougall Parkway, N-E Ramp Sta. 12+778, o/s 8.9m Rt. of Lt. EP ORIGINATED BY MR  
DIST 31 HWY 401 BOREHOLE TYPE C.F.H.S.A., Mud Rotary & NQ Rock Coring COMPILED BY MRA  
DATUM Geodetic DATE February 05, 2002 CHECKED BY DWK

SOIL PROFILE			SAMPLES			GROUND WATER * CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT   NATURAL MOISTURE CONTENT   LIQUID LIMIT			UNIT WEIGHT  γ  kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					w <sub>p</sub>	w	w <sub>L</sub>		GR	SA	SI	CL	
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE	× LAB VANE	WATER CONTENT (%)									
161.46							20	40	60	80	100										
30.00																					
	Sandy silty clay, some gravel  Hard  Grey (Till)		17	SS	30					■			○								
			</																		

**METRIC**

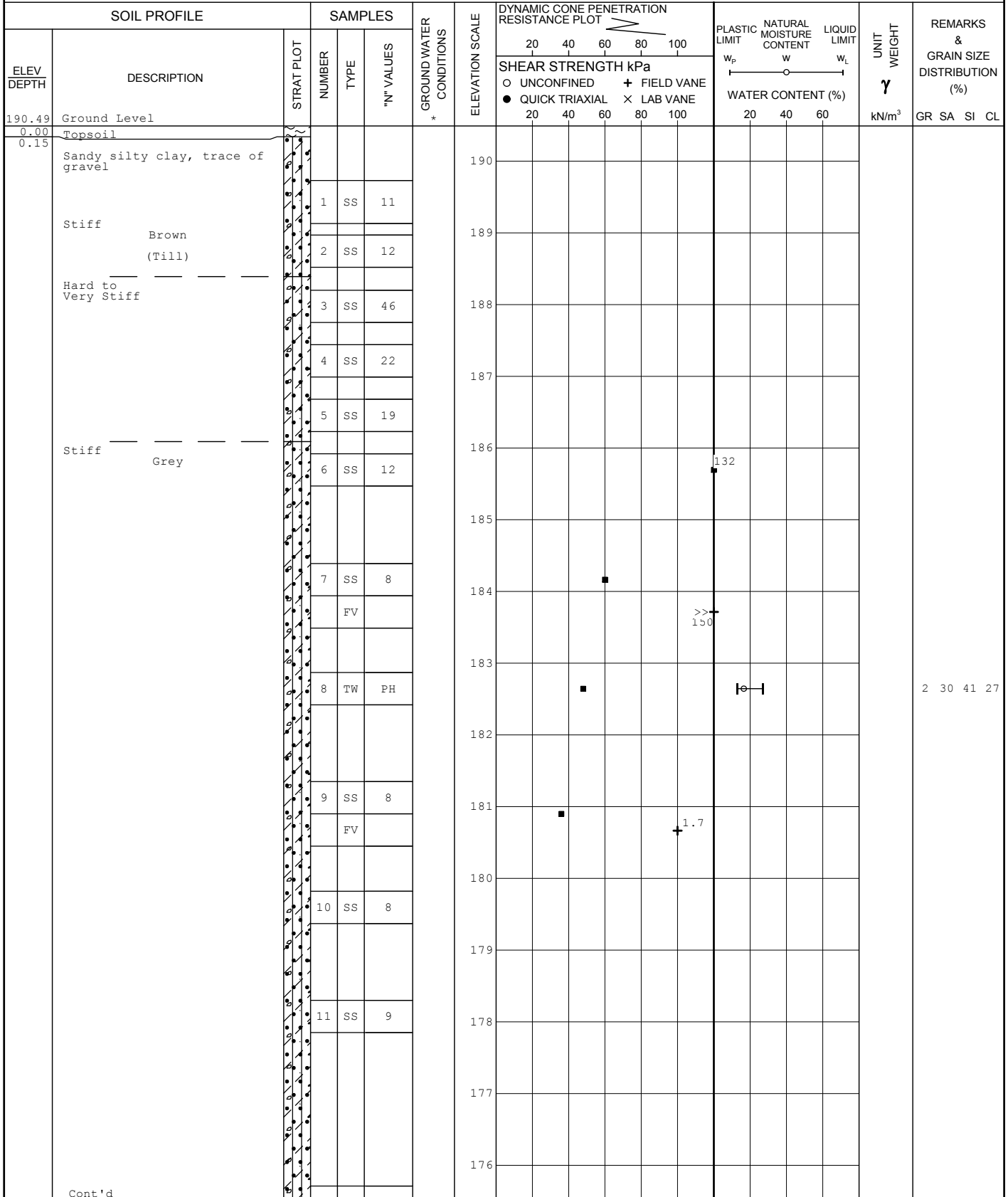
20  
15 — 5 (%) STRAIN AT FAILURE  
10

RECORD OF BOREHOLE No 71-5

1 of 3

METRIC

W.P. 64-00-02 LOCATION Dougall Parkway, N-E Ramp Sta. 12+850, o/s 6.3m Lt. of Lt. EP ORIGINATED BY MR  
DIST 31 HWY 401 BOREHOLE TYPE C.F.H.S.A., Mud Rotary & NQ Rock Coring COMPILED BY MRA  
DATUM Geodetic DATE February 7, 8 and 11, 2002 CHECKED BY DWK



RECORD OF BOREHOLE No 71-5

2 of 3

METRIC

W.P. 64-00-02 LOCATION Dougall Parkway, N-E Ramp  
Sta. 12+850, o/s 6.3m Lt. of Lt. EP ORIGINATED BY MR  
DIST 31 HWY 401 BOREHOLE TYPE C.F.H.S.A., Mud Rotary & NQ Rock Coring COMPILED BY MRA  
DATUM Geodetic DATE February 7, 8 and 11, 2002 CHECKED BY DWK

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT   NATURAL MOISTURE CONTENT   LIQUID LIMIT			UNIT WEIGHT  γ  kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)			
								○ UNCONFINED      + FIELD VANE							w <sub>p</sub> w      w <sub>L</sub>			
						● QUICK TRIAXIAL      × LAB VANE	20	40	60	80	100	20	40	60	GR	SA	SI	CL
175.5			12	SS	11													
	Stiff to Very Stiff (Till)																	
				13	SS	15												
			14	SS	15*													

\* No  
recovery

RECORD OF BOREHOLE No 71-5

3 of 3

METRIC

W.P. 64-00-02 LOCATION Dougall Parkway, N-E Ramp Sta. 12+850, o/s 6.3m Lt. of Lt. EP ORIGINATED BY MR  
DIST 31 HWY 401 BOREHOLE TYPE C.F.H.S.A., Mud Rotary & NQ Rock Coring COMPILED BY MRA  
DATUM Geodetic DATE February 7, 8 and 11, 2002 CHECKED BY DWK

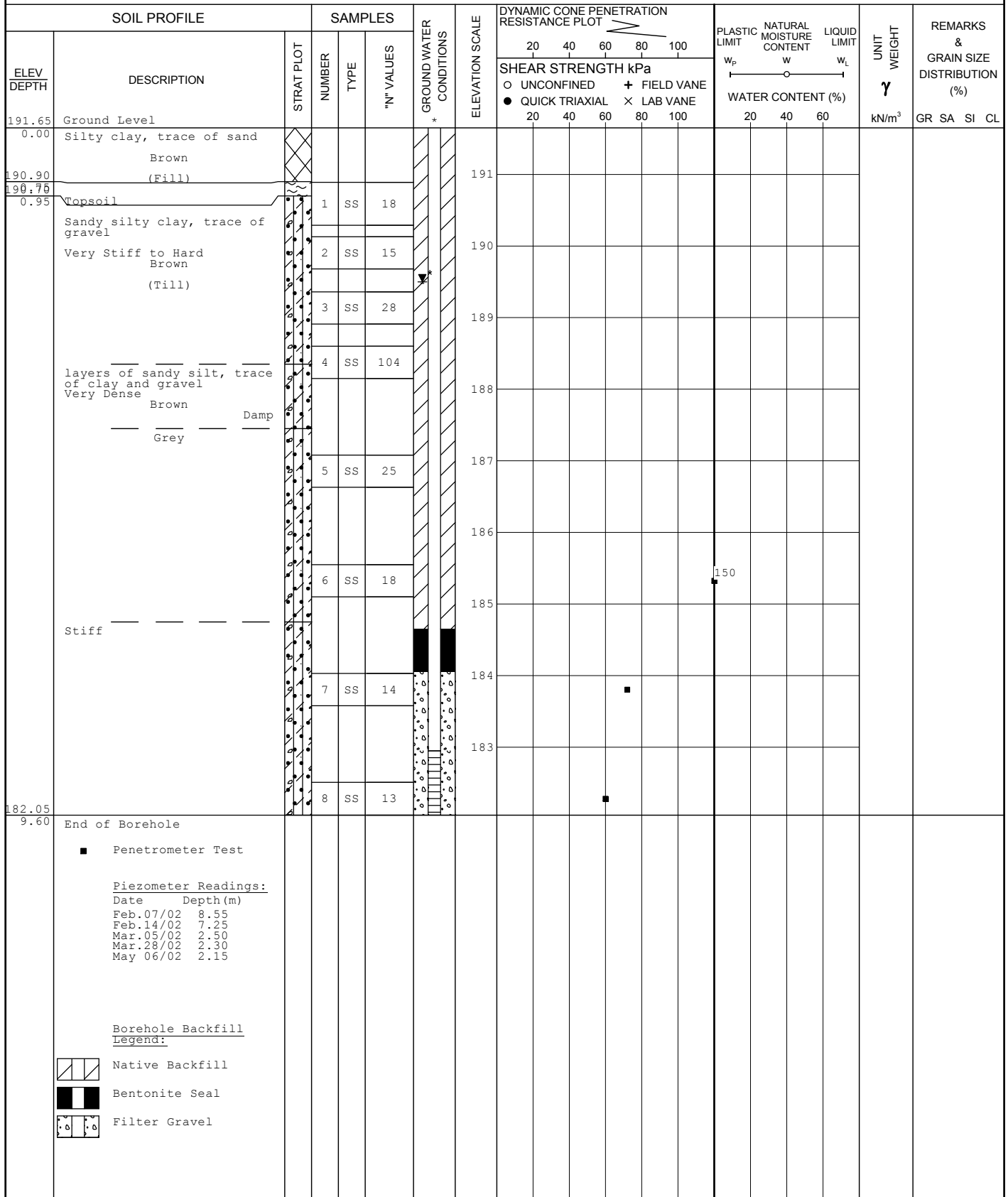
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT   NATURAL MOISTURE CONTENT   LIQUID LIMIT			UNIT WEIGHT  γ  kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)				
								○ UNCONFINED      + FIELD VANE				w <sub>p</sub> w      w <sub>L</sub>				
								● QUICK TRIAXIAL      × LAB VANE								
160.49			17	SS	30											
	(Till)   															

RECORD OF BOREHOLE No 71-6

1 of 1

METRIC

W.P. 64-00-02 LOCATION Dougall Parkway, N-E Ramp Sta. 12+845, o/s 8.8m Rt. of Lt. EP ORIGINATED BY MR  
DIST 31 HWY 401 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY MRA  
DATUM Geodetic DATE February 05, 2002 CHECKED BY DWK





RECORD OF BOREHOLE No 9

1 of 1

METRIC

W.P. 64-00-00 LOCATION Dougall Parkway, EBL-N Leg Sta. 12+691, o/s 21.9m Lt. of CL ORIGINATED BY MR  
DIST 31 HWY 401 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY GD  
DATUM Geodetic DATE February 01, 2002 CHECKED BY MRA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa												
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE	× LAB VANE									
190.48	Ground Level							20	40	60	80	100								
0.00	Topsoil, silty clay																			
0.20	Dark Brown																			
	Sandy silty clay, trace of gravel		1	SS	30		190													
	Hard Brown (Till)		2	SS	44		189													
			3	SS	40		188													
	Very Stiff Grey		4	SS	26		187													
			5	SS	29		186													
			6	SS	20		185													
			7	SS	19		184													
	Stiff		8	SS	12		183													
							182													
180.88			9	TW	PH		181													
9.60	End of Borehole																			
	Borehole dry on completion of drilling																			
	■ Penetrometer Test																			

**METRIC**

20  
15 — 5 (%) STRAIN AT FAILURE  
10

RECORD OF BOREHOLE No 11

1 of 1

METRIC

W.P. 64-00-00 LOCATION Dougall Parkway, EBL-N Leg Sta. 12+876, o/s 17.0m Rt. of CL ORIGINATED BY MR  
DIST 31 HWY 401 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY GD  
DATUM Geodetic DATE February 05, 2002 CHECKED BY MRA

SOIL PROFILE			SAMPLES			GROUND WATER * CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT  γ  kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					w <sub>p</sub>	w	w <sub>L</sub>					
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE	× LAB VANE	WATER CONTENT (%)								
190.56	Ground Level						20	40	60	80	100									
0.00	Topsoil, silty clay																			
0.10	Dark Brown																			
	Sandy silty clay, trace of gravel		1	SS	13								○							
	Stiff to Hard Brown (Till)		2	SS	34								○							
			3	SS	46								○							
	Very Stiff Grey		4	SS	26								○							
			5	SS	22								○							
			6	SS	17								○							