

PUBLIC WORKS AND INFRASTRUCTURE DEVELOPMENT DEPARTMENT

ROADS AND STORMWATER DIVISION

Tel: 012 358 7950
Fax: 012 358 7648
Email: hiltonv@tshwane.gov.za

PO Box 1409
PRETORIA
0001

Room C306, 3rd Floor, Noordvaal Building, 225 Vermeulen Street, Pretoria, 0001

Your ref:

My ref: 10/1/2/1-D12/77

Enquiries: Hannes Claassen

Section: Infrastructure Planning and Management

Date: 30 January 2008

Tel: 012 358 3287

Fax: 012 358 3361

Email: hannesc@tshwane.gov.za

Address: PO Box 14013, LYTTTELTON, 0140

c/o Basden & Rabie Streets, Lyttelton Agr. Holdings

The Manager: Land Use Legislation and Application
City Planning

PRETORIA REGION

Attention: Naomi Malahlela

TOWNSHIP ESTABLISHMENT: GEOLOGICAL REPORT: DIE WILGERS X77

1. The Geotechnical investigation done for this development on a portion 124 of Wonderboom H/A, has reference. The report compiled by Johann vd Merwe dated July 2007 is in order.
2. The following condition must be included in the Scheme:
 - 2.1 An engineer must be appointed before the approval of building plans, who must design, specify and supervise structural measures for the foundations of all structures, according to the soil classification for each zone as described in the geological report. On completion of the structures, he must certify that all his specifications have been met.
3. The report is accepted for proclamation purposes.

Yours faithfully

For : ACTING EXECUTIVE DIRECTOR : ROADS AND STORMWATER

cc TE-Die Wilgers X77

10/1/2/1 - 2/2/11

289 Polaris Avenue
Waterkloof Ridge 0181
Pretoria, GAUTENG
SOUTH AFRICA

TEL: 012 : 347 8467
MOBILE : 082 570 2222
FAX: 012 : 347 9064

P.O. Box 95562
WATERKLOOF 0145
Pretoria, GAUTENG

PROJECT No:

McCARTAN S.
P.O. Box 1253
PRETORIA 000

Attention: Mr. ,

Dear Sir,

**ROADS & STORMWATER
GEOLOGY REPORTS**

REF NO: V.10/1/2/1D12/77

TOWNSHIP: DIE WILGERS

EXT 77

REPORT NO: M07/2877

DATED: JULY 2007

CONSULTANT: JOHANN VD MERWE

TEL NO: 012 347 8467 / FAX NO: 012 347 9064

**REPORT ON A GEOTECHNICAL INVESTIGATION CARRIED OUT FOR THE
PROPOSED NEW: TUCKER OFFICE PARK DEVELOPMENT ON: REMAINDER OF
PORTION 161 OF THE WILLOWS 340-JR, PRETORIA DISTRICT, GAUTENG
PROVINCE**

1. INTRODUCTION

This report presents results and observations on a foundation investigation carried out during May 2007 for the proposed Tucker Office Park development in the eastern part of Pretoria, to be known as *Die Wilgers Extension 77*. The investigation was carried out at the request of Mr. John Shaw of McCartan Shaw & Robinson, Consulting Engineers, Pretoria, who is acting on behalf of his clients, Messrs Rocklea Realty (Pty) Ltd, the registered owner of the property who proposes to establish an office complex on the property.

2. TERMS OF REFERENCE

The objectives of the desk study were to: -

- Determine the engineering properties of the site soils and bedrock including potentially expansive material, low bearing capacity soils and areas difficult to excavate.
- Present appropriate recommendations for commercial township design and precautionary measures in accordance with the requirements of the Tshwane Local Municipality and of the National Home Builders Registration Council's guidelines.

The investigation was carried out in terms of written instructions received from Mr. Des Brand of Bild Architects in his faxed letter of appointment dated 3 May 2007.

3. INFORMATION CONSULTED

The following information was available and was consulted: -

- The 1: 50 000 scale Topographical and Geological Maps 2528CD Rietvleidam.
- A site contour diagram prepared to a scale of 1: 250 by Buckley and Strydom, Land Surveyors, showing existing roads, the boundaries of the site and surface contours at 0,25m intervals.

- A site layout plan prepared to a scale of 1: 100 by Bild Architects, showing the site boundaries and the layout of the proposed development.
- The publication "National Home Builders Registration Council's Home Building Manual, Part 1 & 2, February 1999.

4. SITE DESCRIPTION

The site for the proposed development is situated due north-east of Pretoria CBD as shown on the attached 1: 50 000 scale Locality Map at the back of the report. The study area is roughly rectangular in shape and covers a surface area of some 1,7 hectares. The property is bounded to the north by Lynnwood Road, to the east by east by Wattle Crescent and on the remaining sides by the remainder of Holding 161, The Willows agricultural holdings. The site is devoid of any structures and is covered by large Eucalyptus spp. trees. Surface drainage takes place via sheetwash towards the north-east at an average gradient of some 8%.

5. SITE INVESTIGATION

Ten test pits were excavated across the site for the proposed development using a Bell 315SG backactor supplied by SNA Lab from Waltloo. The test pits were entered by a registered professional engineering geologist, who described the soil and bedrock formations in terms of the methods advocated by Jennings *et al* (1973) namely, moisture condition, colour, soil consistency, soil structure, soil type and origin (MCCSSO).

During the test pit profiling, disturbed and undisturbed representative soil samples were recovered from the test pits and submitted to SNA's commercial soils laboratory in Waltloo for testing and identification. The detailed descriptions of the test pit profiles are provided on the Soil Profile Sheets in Appendix 1 of the report whilst the laboratory test results appear in Appendix 2. The location of the test pits is shown on the "Site Plan", Drawing Number M07/2877 at the back of the report.

6. OBSERVATIONS

The property is blanketed by a moderate horizon of transported soil that is underlain by shale bedrock belonging to the Silverton Formation, Pretoria Group, Transvaal Supergroup. A very generalized description of the typical soil profile that can be encountered over the site is as follows:-

- 0,0 - 0,4: Dry, light grey, loose, voided, silty SAND containing tree roots; colluvium.
- 0,4 - 0,6: Abundant coarse, hard, yellow blotched red and orange, ferruginised SHALE FRAGMENTS and scattered QUARTZITE GRAVELS, clast supported in a matrix as above; pebble marker. Overall consistency is loose.
- 0,6 - 1,0: Abundant coarse, flaky SHALE FRAGMENTS, clast supported in a matrix of dry, dark yellow, silty SAND; reworked residual shale. Overall consistency is loose containing vertical runnels of dense material.
- 1,0+: Light purple thinly banded yellow and orange, highly weathered, very closely bedded and jointed, very soft rock SHALE. The shale bedrock horizon was encountered at depths ranging from 0,6m to 1,4m below ground surface and the bedrock grades to soft rock SHALE with increasing depth.

Gradual refusal to refusal of the backactor was experienced at depths ranging from 1,0m to 1,8m below surface in the shale bedrock. The water table, whether perched or permanent, was not encountered during the investigation that was carried out during the dry season.

7. GEOTECHNICAL CONSIDERATIONS

7.1 Expansive Soils

The site soils are generally sandy and gravelly and are potentially "low" in the degree of expansiveness based on the results of the laboratory tests and according to the Van der Merwe (1964) method. A total surface heave of less than 5mm, is predicted across the site, depending on the locality on site and should the moisture condition of the soils change from a dry to a saturated state.

7.2 Collapsible and Compressible Soils

The upper sandy and gravelly horizons that extend down to some 0,6m to 1,4m below surface, are considered to be potentially compressible, based on a visual appraisal of the soil structure i.e. a loose consistency and a voided texture. These soils were unfortunately too friable in order to take undisturbed soil samples. The thickness of potentially compressible material is shown at each test pit position on the "Site Plan".

7.3 Foundations

Conventional spread or strip footings, placed onto the shale bedrock at depths ranging from 0,6m to 1,4m below surface, are envisaged for proposed multi-storey structures. A safe allowable bearing pressure not exceeding 300 kPa is applicable at this depth. Removal of the large Eucalyptus (bluegum) and other trees which covers portions of the site will probably result in a fair amount of ground disturbance which should be reinstated prior to construction of services and structures. A rebound of the soil moisture is also bound to occur after removal of the trees with settlement induced problems of structures not founded onto bedrock that may result thereof.

7.4 Earthworks

The transported and residual soils and weathered shale bedrock that blanket the site, were tested to determine their compaction characteristics and a summary of the test results appear below in Table 7.1: -

TABLE 7.1: SUMMARY OF COMPACTION TEST RESULTS

HOLE NO	DEPTH (m)	SOIL TYPE	PI	GM	CBR	TRH 14	SWELL (%)
TO/1	0,0 – 0,4	Silty SAND	7	2,18	45	G5	0,01
TO/1	0,4 – 1,0	Clayey SAND	5	0,87	22	G7	0,01
TO/1	1,0 – 1,4	Reworked SHALE	4	0,99	33	G7	0,02
TO/9	0,5 – 1,0	Reworked SHALE	7	1,71	52	G5	0,09
TO/9	1,0 – 1,5	SHALE bedrock	7	1,77	35	G5	0,12

Note : PI = Plasticity Index
GM = Grading Modulus
CBR = California Bearing Ration at 95% Mod AASHTO compaction

Based on the results of the compaction tests, it is apparent that the site soils should be suitable for use as backfill underneath surface beds, as lower selected layers and as sub-base layers (G5/G7 quality) in road-works. The potentially collapsible nature of the upper site soils should be taken into consideration in the design and construction of roads and paved areas.

7.5 Ground Water and Soil Chemistry

Although no seepages of ground water were encountered during the investigation, proper damp-proofing precautions should be taken underneath structures. Removal of the hydrophilic Eucalyptus trees across the site may result in a rebound of the soil moisture regime thereby exacerbating the potentially problematic soil conditions.

The site soils are considered to be potentially chemically aggressive with regards to underground ferrous metal pipes (pH values ranging from 3,79 to 6,62 and electrical conductivity values ranging from 0,004 to 0,014 S/m) and non-ferrous metal pipes or plastic pipes are therefore recommended for wet services and the foundation soils should be treated with an environmentally friendly insecticide to combat termites.

7.6 Excavation Characteristics

No problems should be experienced in excavating any the transported soils over the entire site down to an average depth of at least 1,5m below surface using conventional earth-moving machines. The sidewalls of deep excavations along the southern, western and eastern portions of the site may tend to become unstable if left unsupported for some time, due to the presence of unfavourably dipping bedding and joint planes in the shale rock mass.


8. GENERAL

While every effort has been made to ensure that representative test pitting and sampling has been undertaken to probe the soils on-site, guaranteeing that isolated zones of either poor foundation material or hard rock excavation have not been identified, is impossible under the constraints of an investigation of this nature. The investigation has sought to highlight general areas of potential foundation and excavation problems, and to provide early warning to the design engineers and town planners. In view of the variability inherent in soils, a competent person must inspect all foundation excavations.

It is recommended that the excavations for foundations be inspected by a competent person during construction in order to verify that the materials thus exposed are not at variance with those described in the report. The placement of the fill must be controlled with suitable field tests to confirm that the required densities are achieved during compaction and that the quality of fill material is within specification.

We trust that the above information will meet with your immediate requirements, please do not hesitate to call for any further information.

Yours faithfully,



JOHANN VAN DER MERWE (Pr. Sci. Nat.)
Engineering Geologist

9. APPENDICES

Test Pit Profiles

Laboratory Test Results

Locality Map

Site Plan

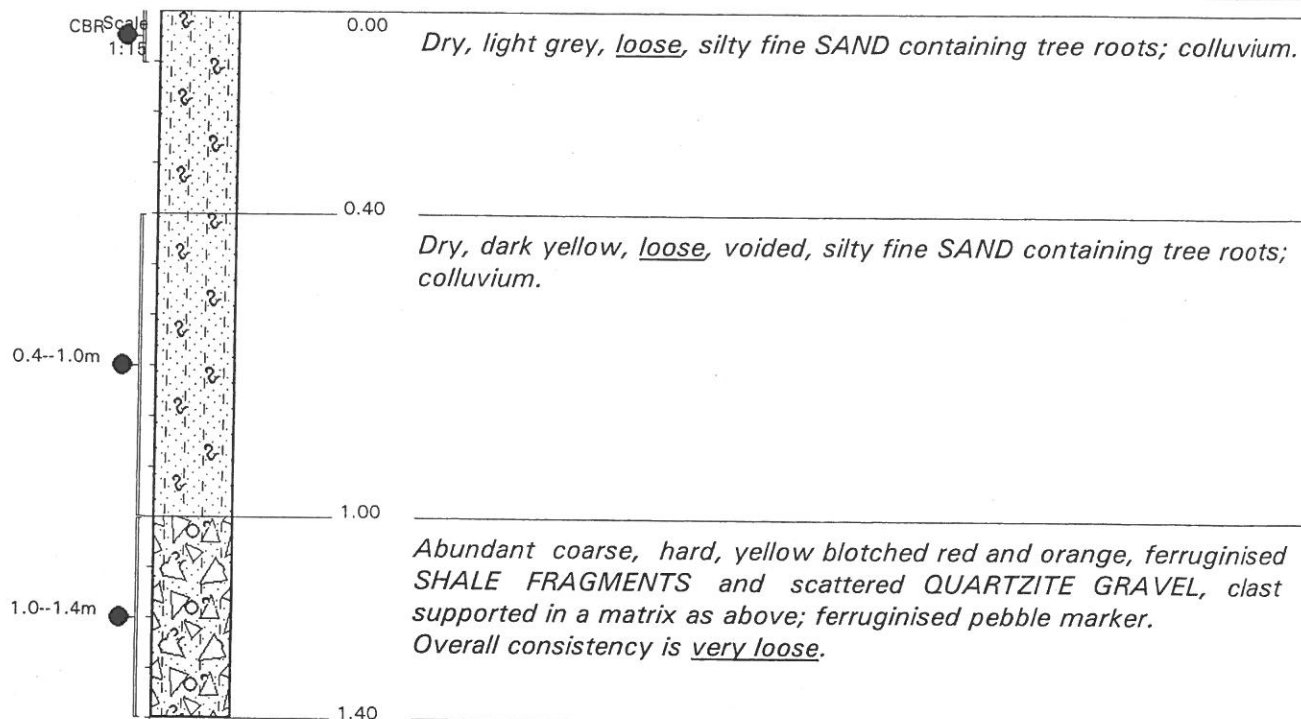
APPENDIX 1 : TEST PIT PROFILES

McCARTAN, SHAW & ROBINSON, Consulting Engineers
 Remainder of Portion 161 of The Willows 340-JR
 GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED NEW TUCKER OFFICE PARK DEVELOPMENT

HOLE No: **TO/1**

Sheet 1 of 1

JOB NUMBER: **M07/2877**



NOTES

- 1) No refusal of bakactor at 1,4m.
- 2) No water seepage encountered.
- 3) Disturbed bulk CBR samples taken from 0,1m--0,4m; 0,4--1,0m; 1,0--1,4m.

CONTRACTOR : **SNA Lab**
 MACHINE : **Bell 315SG backactor**
 DRILLED BY :
 PROFILED BY : **jvdm**
 TYPE SET BY :
 SETUP FILE : **STANDARD.SET**

INCLINATION : **Vertical**
 DIAM : **Trench**
 DATE : **14/05/2007**
 DATE : **14/05/2007**

ELEVATION :
 X-COORD :
 Y-COORD :

DATE : 20/07/07 12:14
 TEXT : ..\DOTPLOT\ARCHIVE\2877.TXT

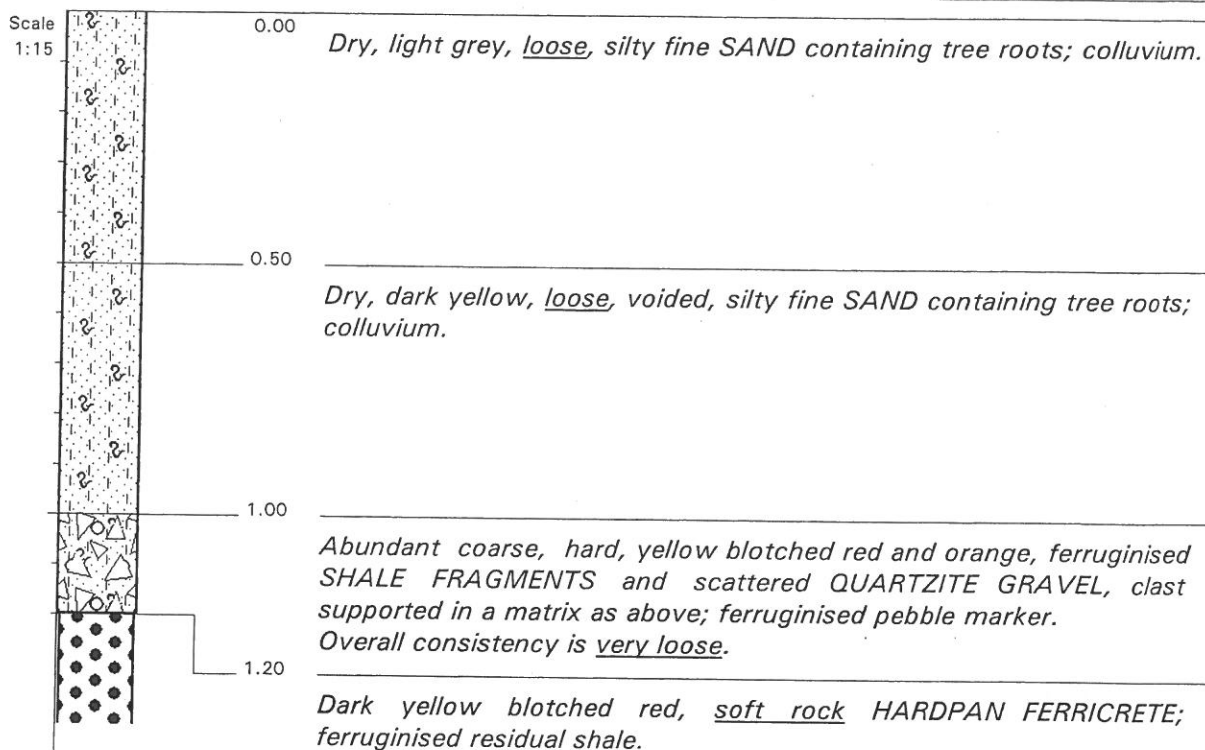
HOLE No: **TO/1**

McCARTAN, SHAW & ROBINSON, Consulting Engineers
 Remainder of Portion 161 of The Willows 340-JR
 GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED NEW TUCKER OFFICE PARK DEVELOPMENT

HOLE No: **TO/2**

Sheet 1 of 1

JOB NUMBER: **M07/2877**



NOTES

- 1) No refusal of backactor at 1,2m.
- 2) No water seepage encountered.

CONTRACTOR : **SNA Lab**
 MACHINE : **Bell 315SG backactor**
 DRILLED BY :
 PROFILED BY : **jvdm**
 TYPE SET BY :
 SETUP FILE : **STANDARD.SET**

INCLINATION :
 DIAM : **Trench**
 DATE : **14/05/2007**
 DATE : **14/05/2007**
 DATE : **20/07/07 12:14**
 TEXT : **..\\DOTPLOT\\ARCHIVE\\2877.TXT**

ELEVATION :
 X-COORD :
 Y-COORD :

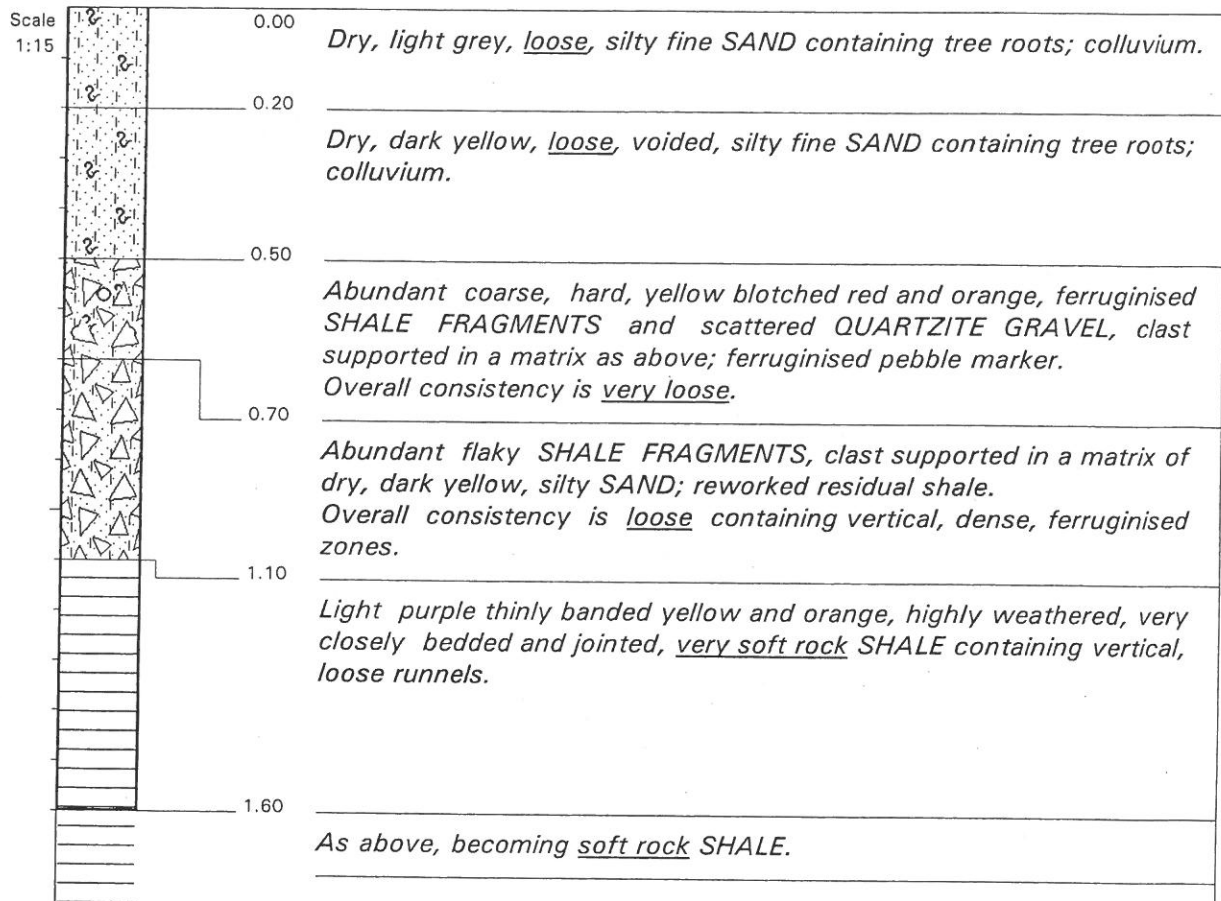
HOLE No: **TO/2**

McCARTAN, SHAW & ROBINSON, Consulting Engineers
 Remainder of Portion 161 of The Willows 340-JR
 GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED NEW TUCKER OFFICE PARK DEVELOPMENT

HOLE No: **TO/3**

Sheet 1 of 1

JOB NUMBER: **M07/2877**



NOTES

- 1) Gradual refusal of backactor at 1,6m in shale bedrock.
- 2) No water seepage encountered.

CONTRACTOR : **SNA Lab**
 MACHINE : **Bell 315SG backactor**
 DRILLED BY :
 PROFILED BY : **jvdm**
 TYPE SET BY :
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM : **Trench**
 DATE : **14/05/2007**
 DATE : **14/05/2007**
 DATE : **20/07/07 12:14**
 TEXT : ..\DOTPLOT\ARCHIVE\2877.TXT

ELEVATION :
 X-COORD :
 Y-COORD :

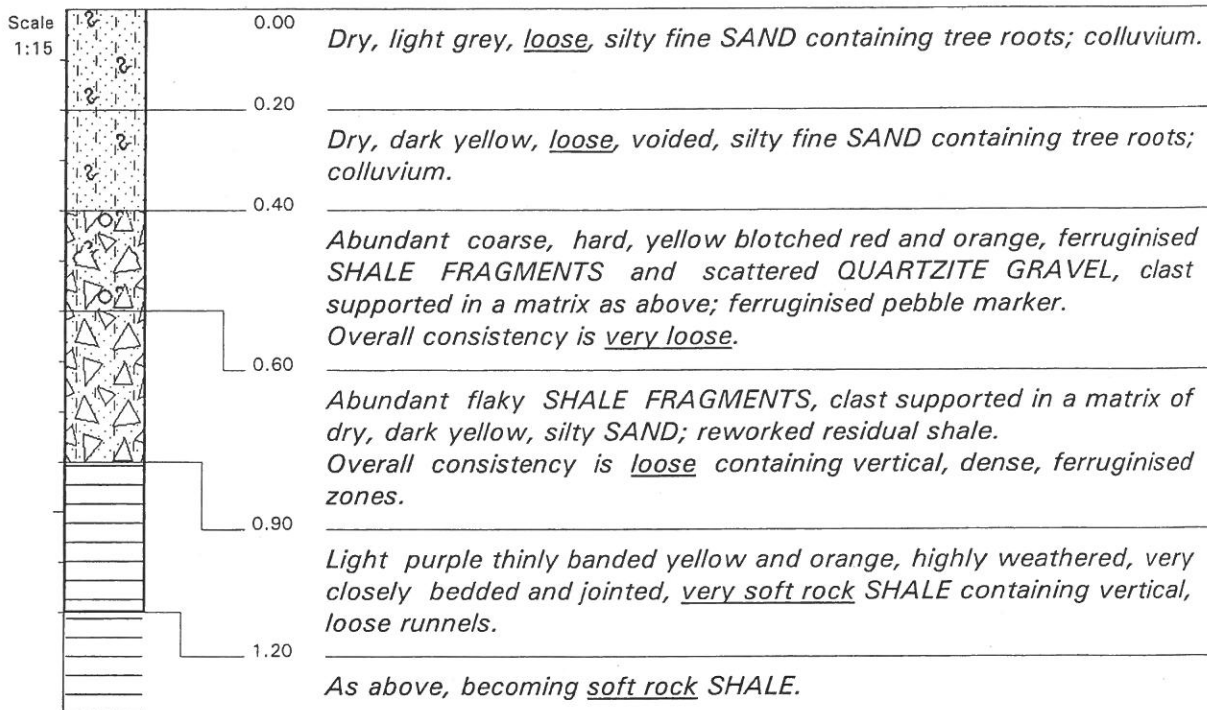
HOLE No: **TO/3**

McCARTAN, SHAW & ROBINSON, Consulting Engineers
 Remainder of Portion 161 of The Willows 340-JR
 GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED NEW TUCKER OFFICE PARK DEVELOPMENT

HOLE No: **TO/4**

Sheet 1 of 1

JOB NUMBER: **M07/2877**



NOTES

- 1) Gradual refusal of backactor at 1,2m in shale bedrock.
- 2) No water seepage encountered.

CONTRACTOR : **SNA Lab**
 MACHINE : **Bell 315SG backactor**
 DRILLED BY :
 PROFILED BY : **jvdm**
 TYPE SET BY :
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM : **Trench**
 DATE : **14/05/2007**
 DATE : **14/05/2007**
 DATE : 20/07/07 12:14
 TEXT : ..\DOTPLOT\ARCHIVE\2877.TXT

ELEVATION :
 X-COORD :
 Y-COORD :

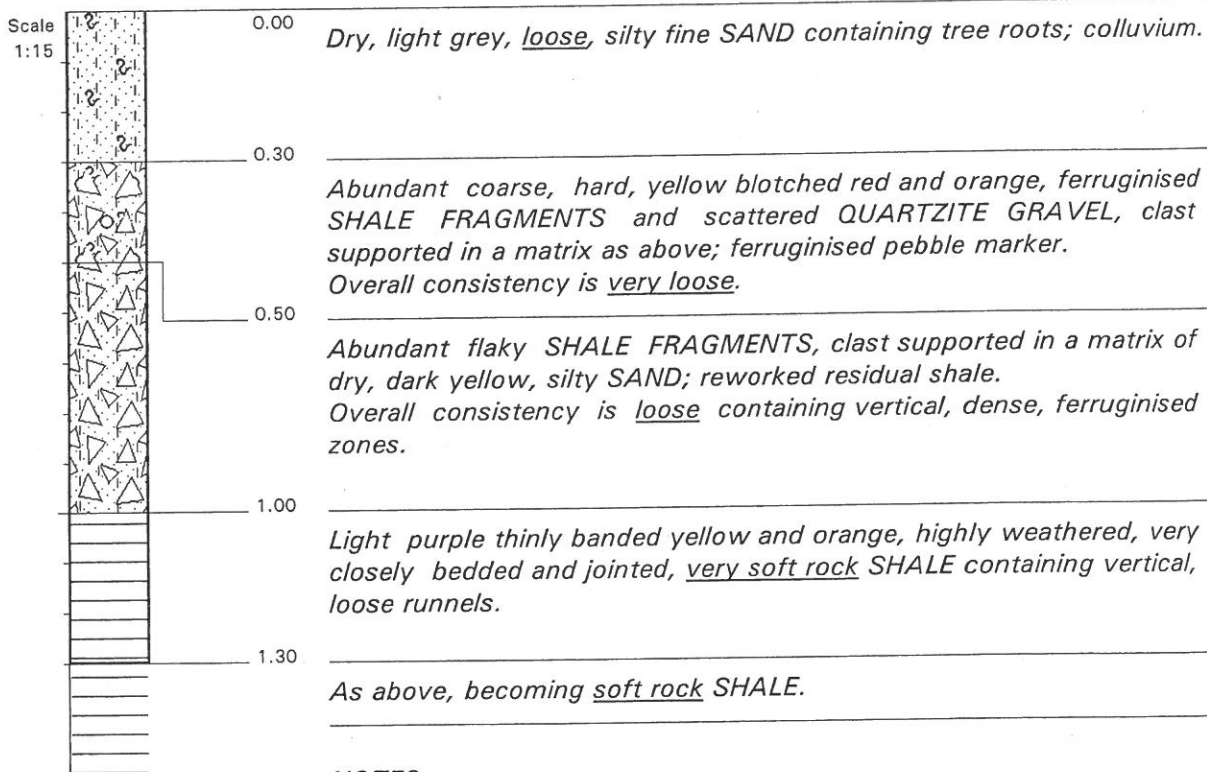
HOLE No: **TO/4**

McCARTAN, SHAW & ROBINSON, Consulting Engineers
 Remainder of Portion 161 of The Willows 340-JR
 GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED NEW TUCKER OFFICE PARK DEVELOPMENT

HOLE No: **TO/5**

Sheet 1 of 1

JOB NUMBER: **M07/2877**



NOTES

- 1) Gradual refusal of backactor at 1,3m in shale bedrock.
- 2) No water seepage encountered.

CONTRACTOR : **SNA Lab**
 MACHINE : **Bell 315SG backactor**
 DRILLED BY :
 PROFILED BY : **jvdm**
 TYPE SET BY :
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM : **Trench**
 DATE : **14/05/2007**
 DATE : **14/05/2007**
 DATE : 20/07/07 12:14
 TEXT : ..\DOTPLOT\ARCHIVE\2877.TXT

ELEVATION :
 X-COORD :
 Y-COORD :

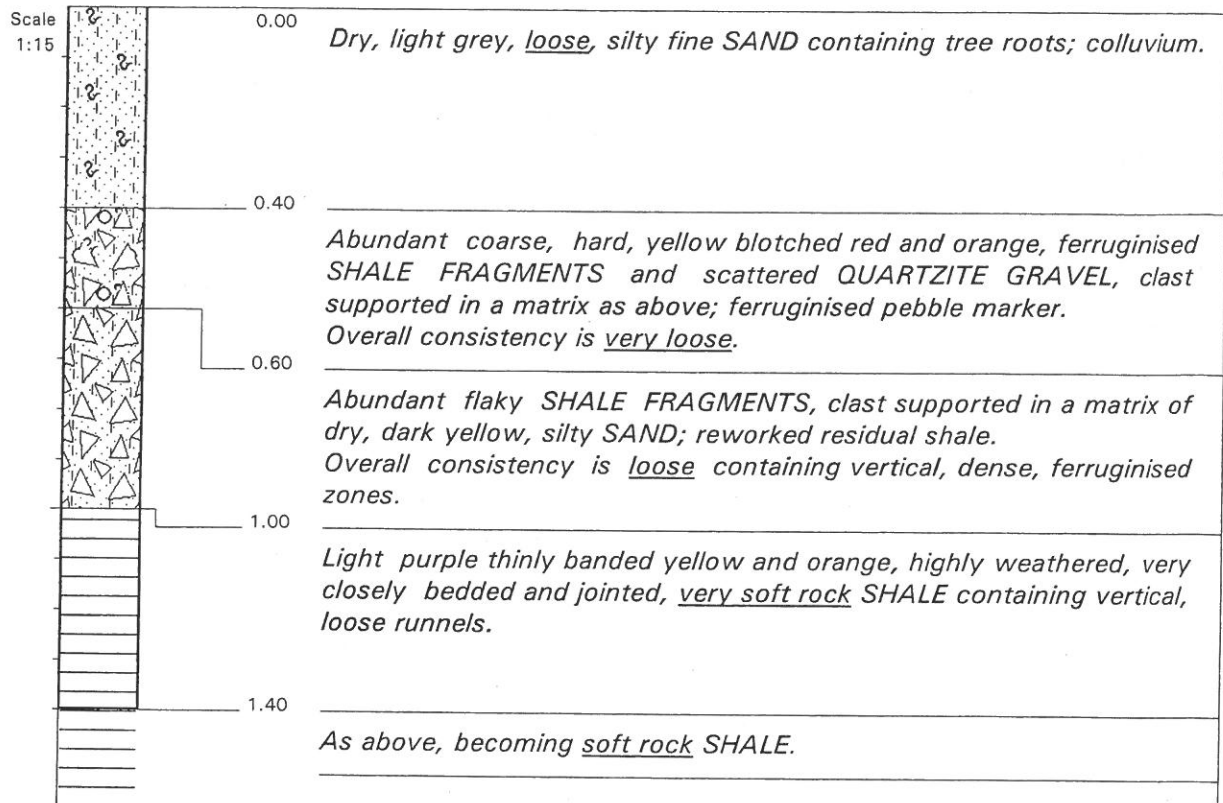
HOLE No: **TO/5**

McCartan, Shaw & Robinson, Consulting Engineers
 Remainder of Portion 161 of The Willows 340-JR
 GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED NEW TUCKER OFFICE PARK DEVELOPMENT

HOLE No: TO/6

Sheet 1 of 1

JOB NUMBER: M07/2877



NOTES

- 1) Gradual refusal of backactor at 1,4m in shale bedrock.
- 2) No water seepage encountered.

CONTRACTOR : SNA Lab
 MACHINE : Bell 315SG backactor
 DRILLED BY :
 PROFILED BY : jvdm
 TYPE SET BY :
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM : Trench
 DATE : 14/05/2007
 DATE : 14/05/2007
 DATE : 20/07/07 12:14
 TEXT : ..\DOTPLOT\ARCHIVE\2877.TXT

ELEVATION :
 X-COORD :
 Y-COORD :

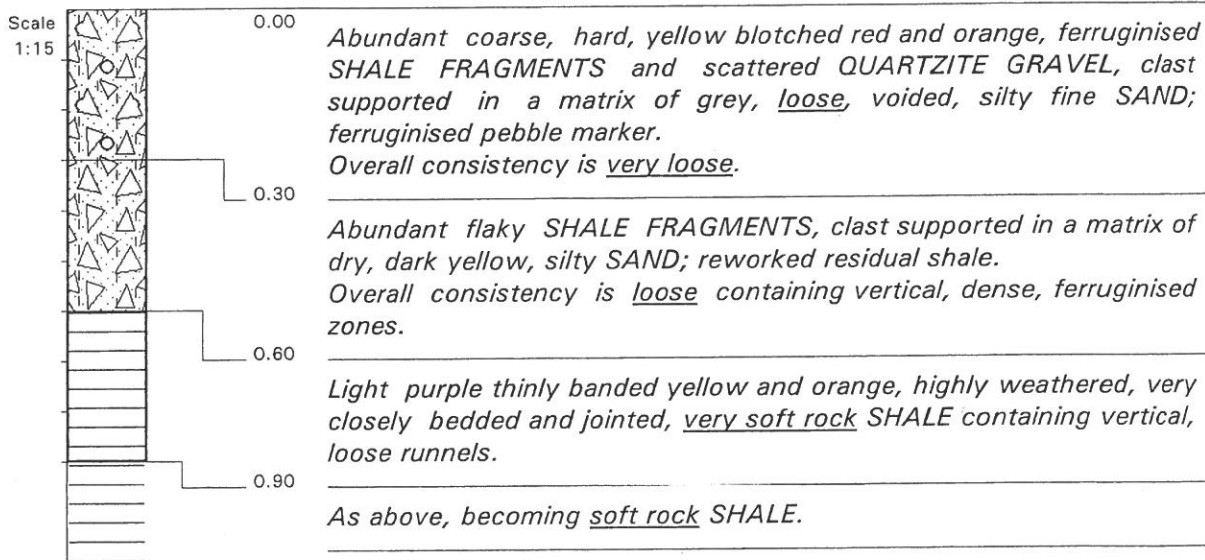
HOLE No: TO/6

McCARTAN, SHAW & ROBINSON, Consulting Engineers
 Remainder of Portion 161 of The Willows 340-JR
 GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED NEW TUCKER OFFICE PARK DEVELOPMENT

HOLE No: **T0/7**

Sheet 1 of 1

JOB NUMBER: **M07/2877**



NOTES

- 1) Gradual refusal of backactor at 0,9m in shale bedrock.
- 2) No water seepage encountered.

CONTRACTOR : **SNA Lab**
 MACHINE : **Bell 315SG backactor**
 DRILLED BY :
 PROFILED BY : **jvdm**
 TYPE SET BY :
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM : **Trench**
 DATE : **14/05/2007**
 DATE : **14/05/2007**
 DATE : 20/07/07 12:14
 TEXT : ..\DOTPLOT\ARCHIVE\2877.TXT

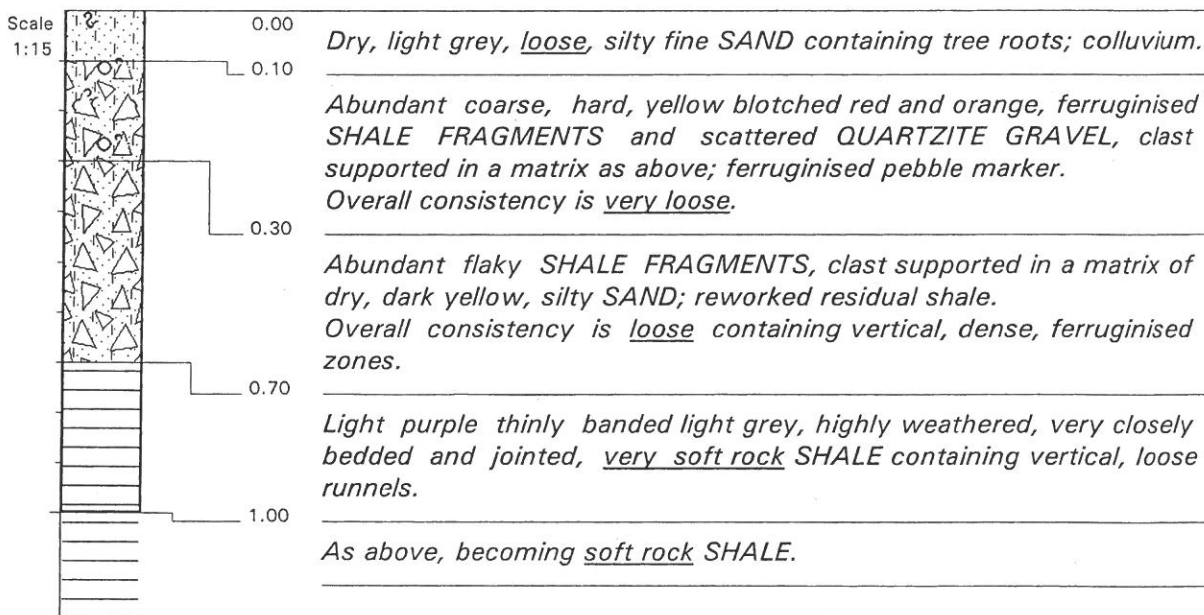
ELEVATION :
 X-COORD :
 Y-COORD :

HOLE No: **T0/7**

McCARTAN, SHAW & ROBINSON, Consulting Engineers
 Remainder of Portion 161 of The Willows 340-JR
 GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED NEW TUCKER OFFICE PARK DEVELOPMENT

HOLE No: **TO/8**
 Sheet 1 of 1

JOB NUMBER: **M07/2877**



NOTES

- 1) Gradual refusal of backactor at 1,0m in shale bedrock.
- 2) No water seepage encountered.

CONTRACTOR : **SNA Lab**
 MACHINE : **Bell 315SG backactor**
 DRILLED BY :
 PROFILED BY : **jvdm**
 TYPE SET BY :
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM : **Trench**
 DATE : **14/05/2007**
 DATE : **14/05/2007**
 DATE : 20/07/07 12:14
 TEXT : ..\DOTPLOT\ARCHIVE\2877.TXT

ELEVATION :
 X-COORD :
 Y-COORD :

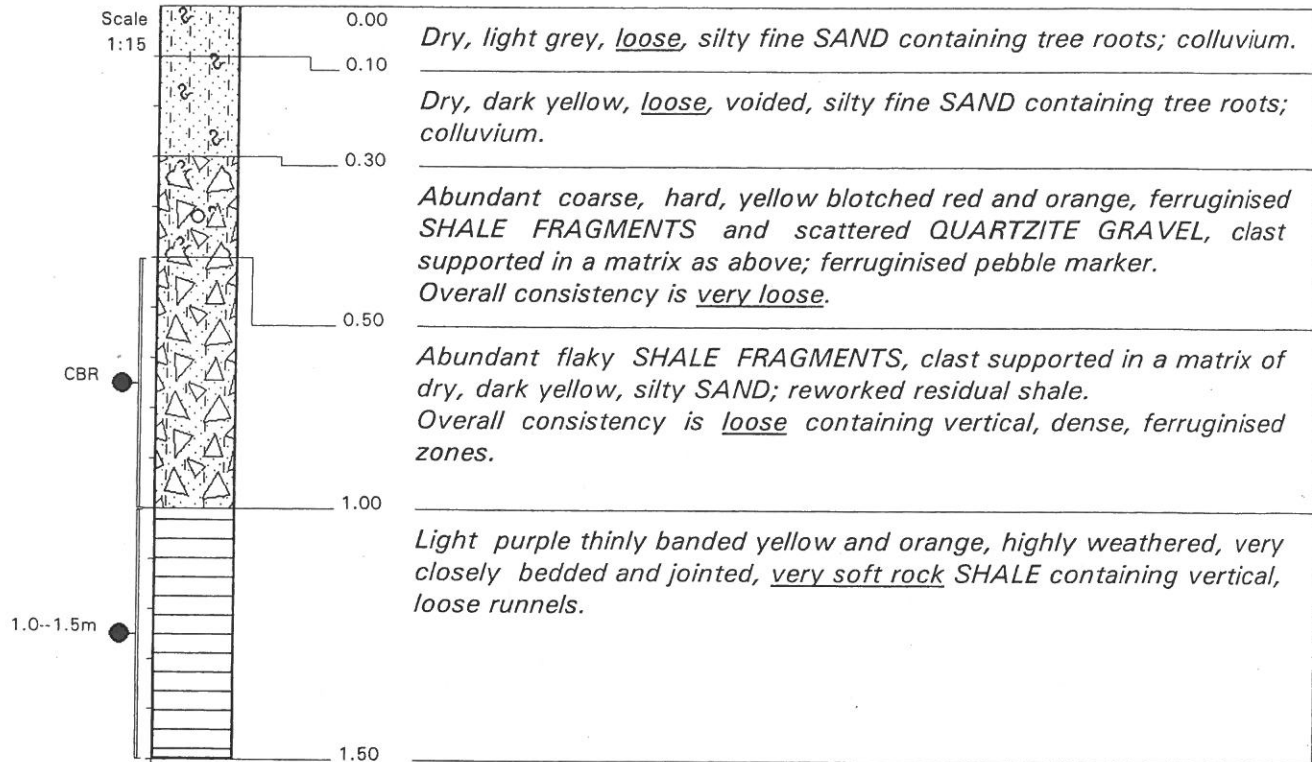
HOLE No: **TO/8**

McCARTAN, SHAW & ROBINSON, Consulting Engineers
 Remainder of Portion 161 of The Willows 340-JR
 GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED NEW TUCKER OFFICE PARK DEVELOPMENT

HOLE No: **TO/9**

Sheet 1 of 1

JOB NUMBER: **M07/2877**



NOTES

- 1) No refusal of backactor at 1,5m.
- 2) No water seepage encountered.
- 3) Disturbed CBR samples taken from 0,5--1,0m and from 1,0--1,5m.

CONTRACTOR : **SNA Lab**
 MACHINE : **Bell 315SG backactor**
 DRILLED BY :
 PROFILED BY : **jvdm**
 TYPE SET BY :
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM : **Trench**
 DATE : **14/05/2007**
 DATE : **14/05/2007**
 DATE : **20/07/07 12:14**
 TEXT : ..\DOTPLOT\ARCHIVE\2877.TXT

ELEVATION :
 X-COORD :
 Y-COORD :

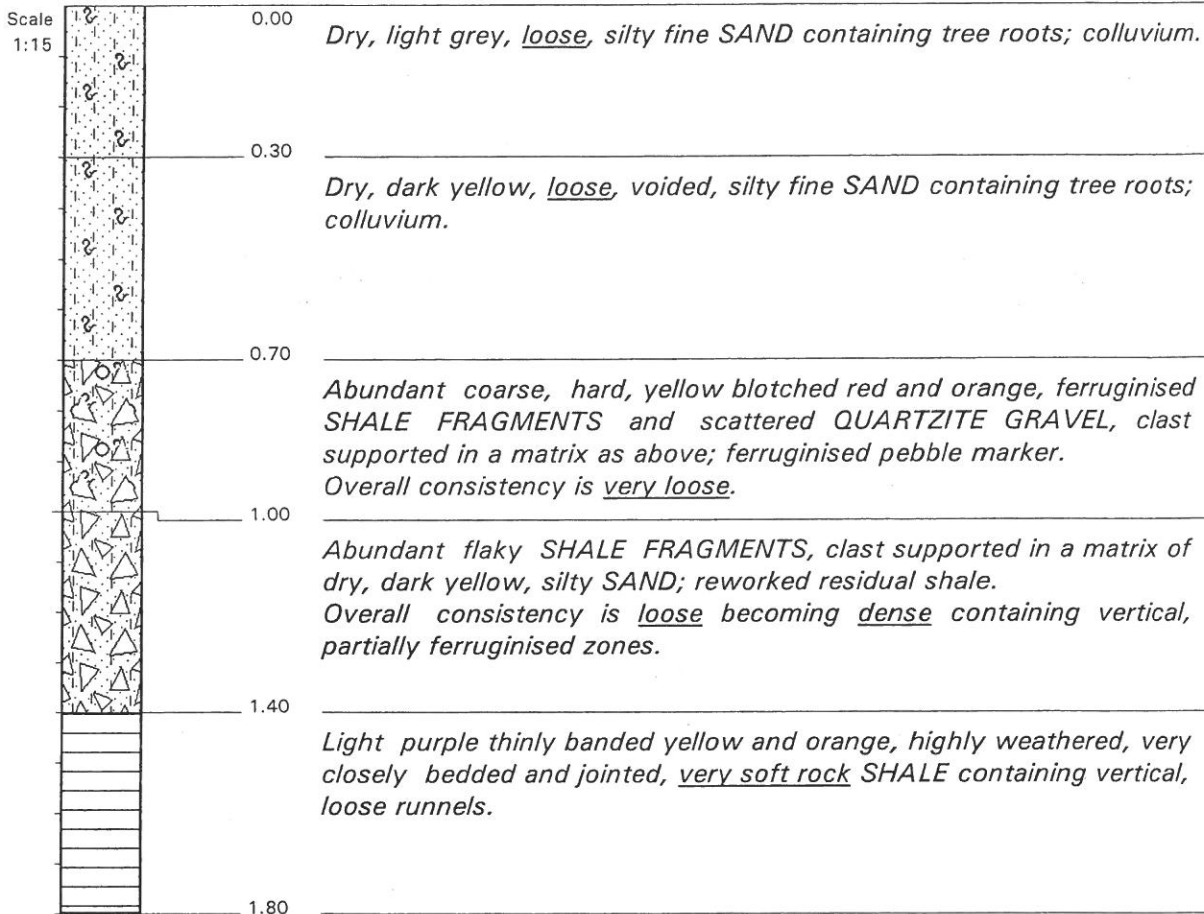
HOLE No: **TO/9**

McCARTAN, SHAW & ROBINSON, Consulting Engineers
 Remainder of Portion 161 of The Willows 340-JR
 GEOTECHNICAL INVESTIGATION CARRIED OUT FOR:
PROPOSED NEW TUCKER OFFICE PARK DEVELOPMENT

HOLE No: **TO/10**

Sheet 1 of 1

JOB NUMBER: **M07/2877**



NOTES

- 1) No refusal of backactor at 1,8m.
- 2) No water seepage encountered.


CONTRACTOR : **SNA Lab**
 MACHINE : **Bell 315SG backactor**
 DRILLED BY :
 PROFILED BY : **jvdm**
 TYPE SET BY :
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM : **Trench**
 DATE : **14/05/2007**
 DATE : **14/05/2007**
 DATE : 20/07/07 12:14
 TEXT : ..\DOTPLOT\ARCHIVE\2877.TXT

ELEVATION :
 X-COORD :
 Y-COORD :

HOLE No: **TO/10**

APPENDIX 2: LABORATORY SOIL TEST RESULTS

 PO Box 72727 Lynnwood Ridge '0040		Client C.No. Order	JOHAN VD MERWE 2877	Agent Fax/Te Cell	JOHAN VD MERWE (012) 347 9064 082 5702222	Project Rd/Sect/BP Layer/Holes	TUCKERS OFFICE PARK	Lab # Proj # Date	7978 13/452 2007/05/16																		
Tel: (012) 842-0060 Fax: (012) 803-4630																											
<h1 style="text-align: center;">INDICATORS</h1>																											
HOLE & / SAMPLE No.		DEPTH	SIEVE ANALYSIS PASSING # mm (%)										TMH 1: Method A1 - A5				TMH 1: Method A2 + A3		TMH 1: Method A20	TMH 1: Method A21T	REMARKS						
MATERIALS DESCRIPTION			75.0	63.0	53.0	37.5	26.5	19.0	13.2	4.75	2.0	0.425	0.075	SOIL MORTAR ANAL (% vs # mm)				GM	ATTEMBERG LIMITS (%)			pH	ELECTRIC CONDUCT. (S/m)	TRB CLASS. & GROUP INDEX. CSRA TRH 4 & 14 CLASSIFICATION			
TO/1		1.0-1.4						100	97	56	37	32	13	13	13	19	22	12	34	2.18	18	2.5	7	4.69	0.009	A-2-4 (0)	(1)
TO/1		0.4-1.0							100	100	98	83	31	31	11	22	11	31	0.87	18	2.6	5	3.79	0.014	A-2-4 (0)	(2)	
TO/1		0.0-0.4							100	100	99	78	24	22	35	13	5	24	0.99	17	1.9	4	4.56	0.017	A-2-4 (0)	(3)	
TO/9		0.5-1.0						100	96	67	57	47	25	17	18	13	8	43	1.71	22	3.3	7	4.65	0.005	A-2-4 (0)	(4)	
TO/9		1.0-1.5						100	97	64	51	41	31	20	10	6	4	61	1.77	21	3.9	7	6.62	0.004	A-2-4 (0)	(5)	
																								()	(6)		
																									()	(7)	
																									()	(8)	
																									()	(9)	
																									()	(10)	
REMARKS:																				TECH:	DATE:	18/06/07					

MDD / OMC

SAMPLE No. TEST STAB.AGENT. PERCENTAGE		MDD / OMC (MOD.AASHTO.)				COMPACTION										CBR %		SUMMARY		STABILISATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
		MC		DENSITY		EFFORT SWELL %	COMP M C %	DRY DENS. kg/m ³	REL. COMP %	UCS ITS (kPa)	REL COMP %	CBR UCS ITS kPa	Curing Regime	CBR UCS ITS kPa	LL %	LS %	PI %																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
%	WET kg/m ³	%	DRY kg/m ³	MC %	AV.MC													7.4	MDD	2249	9.7	2168	1976	10.7	2237	2021	11.7	2196	1966	12.7	2161	1917	13.7	2129	1872	10.8	MDD	2020	7.9	2110	1956	8.9	2178	2000	10.9	2219	2001	11.9	2204	1970	12.9	2171	1923	9.9	MDD	2019																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
TO/1		5.3	2330	2213	2213																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	</

[illegible]

SCALE: 1:50 000

