

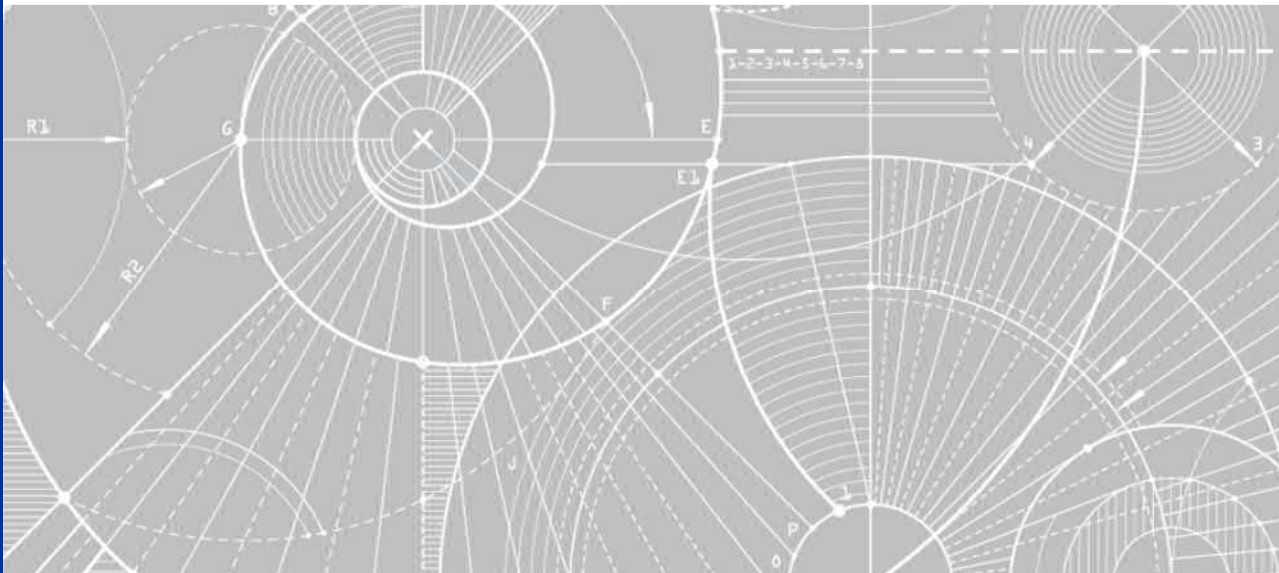
# SDL Adjustment Supply Measures Concept Design

## Geotechnical Investigation Report

IS079600-002 | 2

Mallee Catchment Management Authority

September 2016



## SDL Adjustment Supply Measures Concept Design

Project no: IS079600 and 135300  
 Document title: Geotechnical Investigation Report  
 Document no: IS079600-002  
 Revision: 2  
 Date: 6 September 2016  
 Client name: Mallee Catchment Management Authority  
 Project manager: Kelly Maslin, John McCrann  
 Author: Craig Johnson, Michael Scott

Jacobs Group (Australia) Pty Limited  
 ABN 37 001 024 095  
 Floor 11, 452 Flinders Street  
 Melbourne VIC 3000  
 PO Box 312, Flinders Lane  
 T +61 3 8668 3000  
 F +61 3 8668 3001  
 www.jacobs.com

COPYRIGHT: The concepts and information contained in this document are the property of Jacobs Group (Australia) Pty Limited. Use or copying of this document in whole or in part without the written permission of Jacobs constitutes an infringement of copyright.

### Document history and status

Revision	Date	Description	By	Review	Approved
0	12/12/14	Draft	CJ	KAM	KAM
1	3/2/15	Rev 1	CJ	KAM	KAM
2	6/9/16	Rev 2	MS	DG	JM

**Contents**

**1. Introduction .....2**

**2. Site Description.....3**

**3. Previous Geotechnical Investigations .....4**

**4. Jacobs Geotechnical Investigation .....5**

4.1 Scope of Work .....5

4.2 Test Pit Investigation .....6

4.3 Borehole Investigation .....8

4.4 Cone Penetration Testing Investigation .....9

4.5 Potential Borrow Locations .....10

**5. Laboratory Testing.....11**

**6. Site Conditions.....14**

6.1 Summary of Geology.....14

6.2 Site Stratigraphy.....17

6.3 Cemented Horizons.....20

6.4 Groundwater .....21

6.5 Soil Erosion.....21

**7. Structures and Banks .....23**

7.1 General.....23

7.2 Burra Creek .....23

7.2.1 Banks .....23

7.2.2 Regulator Structures.....24

7.2.3 Drop Structure.....25

7.3 Nyah.....25

7.3.1 Banks .....25

7.3.2 Regulator Structures.....26

7.3.3 Drop Structure.....27

7.4 Vinifera .....27

7.4.1 Banks .....27

7.4.2 Regulator Structures.....28

7.4.3 Drop Structure.....29

**8. References .....30**

**Appendix A. Investigation Location Plans**

**Appendix B. Test Pit and Borehole Logs**

**Appendix C. CPT Results**

**Appendix D. Laboratory Test Certificates**

**Appendix E. Ground Profile- Cross Sections**

## Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to present the findings of a geotechnical investigation conducted at Burra Creek, Nyah Forest and Vinifera Park for the development of the advanced concept designs in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of Jacobs's Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.



## 1. Introduction

The Murray Darling Basin Plan sets a sustainable diversion limit (SDL) for each catchment and aquifer in the Basin. The SDLs act as a cap on water use and regulate the amount of water that can be extracted for consumptive use.

Jacobs was engaged by Mallee CMA to develop advanced concept designs for SDL Adjustment projects at Burra Creek, Nyah Forest and Vinifera Park. As part of the engagement, a geotechnical investigation was undertaken to assess the subsurface soil profile.

The results of the investigation presented in this report include:

- Brief description of previous investigations by others.
- Description of fieldwork and subsurface conditions by Jacobs including:
  - Test pit and borehole logs,
  - Cone Penetration Test (CPT) results, and
  - Laboratory Results.
- Discussion of site conditions.

## 2. Site Description

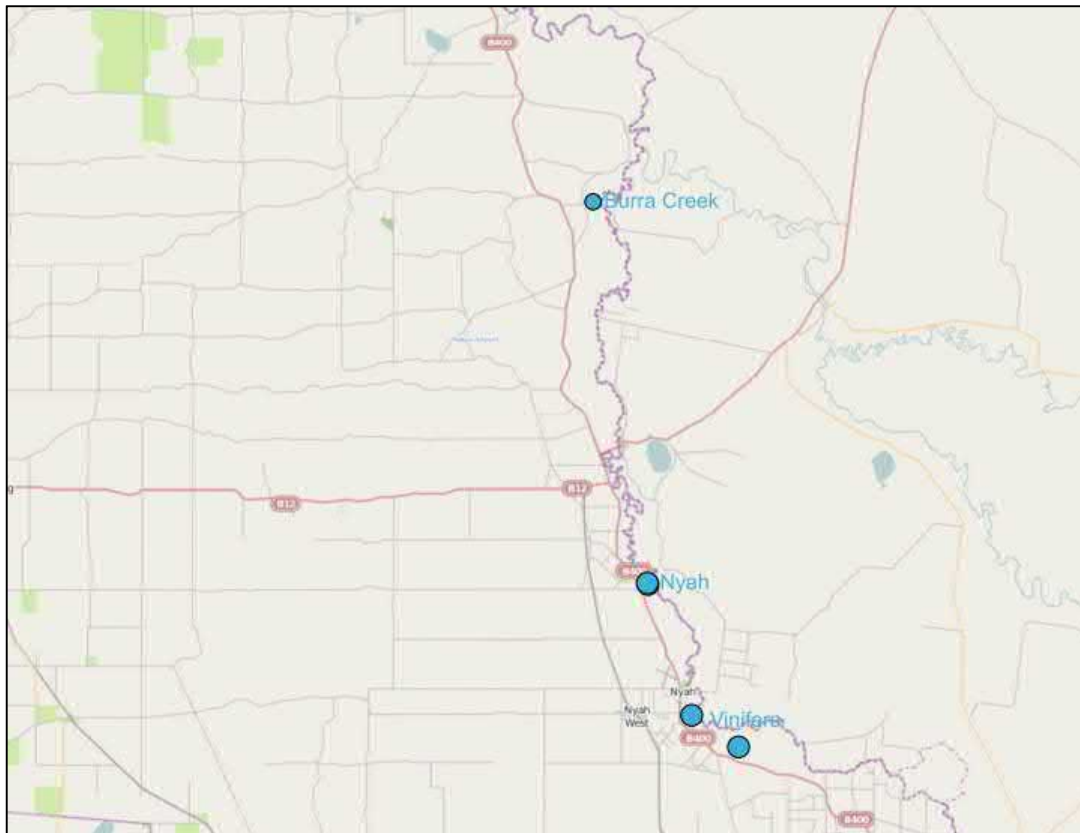
The sites for the proposed SDL Adjustment Projects are located in Burra Creek, Nyah Forest and Vinifera Park.

The Burra Creek site is located west of the Murray Valley Highway and north of Tooleybuc Township.

The Nyah site is located east of the Murray Valley Highway and west of the Murray River near the Nyah Township.

Vinifera Park is located north-east of the Murray Valley Highway and south-west of the Murray River near the Vinifera Township, Victoria.

All sites are located within State Forests and are accessed via unsealed access roads with the general surroundings consisting of large scattered trees and native bushland. The site locations are presented on **Figure 1**.



**Figure 1 – SDL Adjustment Project Locations (not to scale)**

Site location plans presenting the investigation locations are included in Error! Reference source not found..

### 3. Previous Geotechnical Investigations

The Aitken Rowe (2012) report describes the soil profiles at proposed structure locations at Nyah and Vinifera (no investigation was performed at Burra Creek).

The previous geotechnical investigation identified that the upper part of the subsurface soil profile generally comprises uncontrolled fill along access tracks. Underlying this fill layer, the profile generally consisted of firm to stiff, medium to high plasticity clay and this was described to be 5-6m depth. A Clayey silt/sand was described below this depth. Sand layers were also noted at shallower depths in the profile at some locations (i.e. within the clay layer).

Some observations drawn from the Aitken Rowe report are:

- Seepage was encountered in a number of the boreholes at about 5m depth, although it was not clear if this was the static groundwater level as no groundwater monitoring results were reported;
- The soils described in the report were noted as being moderately to highly dispersive;
- Sands were observed to generally be located at depth and was reported as being medium dense with a high fines content.
- The soils tested were generally regarded as non-aggressive towards concrete and steel.
- Some of the soil permeability values reported were anomalous; and
- No borrow area investigations were reported.

## 4. Jacobs Geotechnical Investigation

### 4.1 Scope of Work

Jacobs has undertaken this geotechnical investigation to supplement the results of the previous investigation (Aitken Rowe, 2012) to assess the suitability of the existing soil profiles for the proposed regulator and bank structures. The investigation comprised the following:

- Review of existing geotechnical information;
- Test Pit Investigation
  - Excavation of 16, 12 and 18 test pits along the proposed bank alignment and at the location of proposed regulator structures in Burra Creek, Nyah and Vinifera respectively.
  - Disturbed samples were collected from the test pits for laboratory testing for the assessment of index and strength characteristics for the soil profile. Shear vane tests were performed in-situ in the top 1.5m of the test pit to assess the undrained shear strength of any cohesive material.
  - Dynamic Cone Penetrometer (DCP) tests were performed adjacent to selected test pits to a target depth of 1.5m, or to effective penetration refusal. The purpose of the DCPs was to assess the relative in situ strength of the near surface soils.
  - Bulk samples were also collected from test pits at potential external borrow sources, with laboratory testing performed on these samples to determine their index and compaction characteristics.
- Borehole Investigation
  - Fifteen (15) boreholes were drilled across the three sites; to depths of up to 10m below ground level at nominated structure locations. These boreholes were typically drilled adjacent to CPT locations to allow correlation of the soil profile between the borehole and CPT information and to optimise borehole sampling.
  - Disturbed and undisturbed samples were collected from boreholes, with laboratory testing undertaken for the assessment of index, strength, permeability and shrink-swell characteristics. Shear vane tests were performed in the base of undisturbed push tube samples (63mm diameter) where possible to assess the undrained shear strength of cohesive material.
- Cone Penetration Testing (CPT)
  - CPT tests were performed at seventeen (17) locations across the three sites, to depths of up to 8.8m below ground level or to effective penetration refusal.

The investigation location plans are presented on figures in Error! Reference source not found..

## 4.2 Test Pit Investigation

The initial test pit investigation was undertaken between 21 to 27 October 2014 and a subsequent test pit investigation was undertaken on 22 June 2016.

The subsequent test pit investigation was undertaken to investigate a proposed bank between V3 and V4 structures. The investigations were undertaken under the supervision of an experienced engineering geologist or geotechnical engineer from Jacobs. The investigation methodology was consistent with Australian Standard AS 1726-1993 (Geotechnical Site Investigations) and Jacobs' standard work procedures.

A total of 46 test pits were excavated over the three sites, using; for the initial investigation, a Case CX36B tracked excavator equipped with a 350mm wide bucket and for the subsequent investigation, a backhoe. The excavator was supplied and operated by Ashley Shirnack Contracting and the backhoe was supplied and operated by Coburns Earthworks. The test pits were excavated beside the existing access tracks under the full-time supervision of cultural heritage representative from Mallee CMA.

The subsurface profile in each test pit was described and disturbed soil samples were collected for laboratory testing. Where possible, shear vane tests were performed in the walls of the test pits to assess the in-situ strength of the soils.

Upon completion, the test pits were backfilled with the excavated material, which was rolled and compacted in place with the excavator bucket at the surface.

Dynamic Cone Penetration (DCP) testing was conducted adjacent to selected test pits at bank locations i.e. where CPT testing was not conducted.

A summary of the test pit details is presented in Table 4-1 and the test pit logs are presented in Error! Reference source not found..

**Table 4-1 Summary of Test Pit Information**

Test Pit ID	Feature/Location	Approximate Easting (m) <sup>1</sup>	Approximate Northing (m) <sup>1</sup>	Final Depth (m bgl) <sup>2</sup>	DCP Test Depth (m bgl) <sup>2</sup>
<b>Burra Creek</b>					
BCTP01	B1	711711	6136858	2.70	-
BCTP02		711723	6136840	0.40	-
BCTP03		711737	6136812	2.30	-
BCTP04	Bank	711895	6136697	1.05	1.3
BCTP05		712145	6136616	1.50	1.4
BCTP06		712227	6136433	1.00	1.5
BCTP07		712346	6136337	1.25	1.5
BCTP08		712569	6136054	1.00	1.5
BCTP09		712733	6135122	1.00	1.5
BCTP10		712783	6134825	1.00	1.5
BCTP11		712958	6134590	1.00	1.5
BCTP12		B2	712093	6131923	2.70
BCTP13	712173		6131921	2.80	-
BCTP14	B4	712769	6122005	2.70	-
BCTP15		712754	6121990	0.10	-
BCTP16		712738	6121981	2.80	-

Test Pit ID	Feature/Location	Approximate Easting (m) <sup>1</sup>	Approximate Northing (m) <sup>1</sup>	Final Depth (m bgl) <sup>2</sup>	DCP Test Depth (m bgl) <sup>2</sup>
<b>Nyah</b>					
NNTP01	Bank	714002	6112564	1.20	2.4
NNTP02		714264	6112583	1.00	2.2
NNTP03		714534	6112495	1.00	1.5
NNTP04	N1	714654	6112248	2.75	-
NNTP05		714709	6112155	1.00	-
NNTP06	N2	714776	6112072	2.65	-
NNTP07		714789	6112053	2.85	-
NNTP08	Bank	714821	6111972	1.00	1.5
NNTP09		716476	6110260	1.00	-
NSTP01	N5	716990	6107069	2.70	-
NSTP02		716985	6107048	2.6	-
NSTP03		716980	6107059	0.3	-
<b>Vinifera</b>					
VNTP01	V1	717145	6103847	1.00	-
VNTP02	Bank	717231	6103783	1.80	1.5
VNTP03	V2	717383	6103606	2.20	-
VNTP04	Bank	717594	6103574	1.00	1.5
VSTP01	V4	720351	6102810	2.70	-
VSTP02		720342	6102800	2.30	-
VSTP03		720348	6102806	0.30	-
VSTP04	V3	720286	6101563	1.00	-
VSTP05		720255	6101579	2.00	-
VSTP06		720278	6101562	1.00	-
VSTP07		Bank between V3 and V4	720205	6101623	1.5
VSTP08	720074		6101802	1.7	
VSTP09	720145		6102009	1.6	
VSTP10	720267		6102068	1.5	
VSTP11	720476		6102295	1.7	
VSTP12	720474		6102501	1.5	
VSTP13	720450		6102694	1.6	
VSTP14	720372		6102800	1.4	

<sup>1</sup>: coordinates provided in WGS 84 54S

<sup>2</sup>: m bgl: metres below ground level

### 4.3 Borehole Investigation

The initial borehole geotechnical investigation was undertaken between 27 to 31 October 2014 and a subsequent borehole investigation was undertaken between 20 to 21 June 2016.

The subsequent borehole investigation was undertaken to investigate proposed drop structure locations and to provide additional information to inform the selection of geotechnical design parameters at the B1 structure location.

The investigations were undertaken under the supervision of an experienced geotechnical engineer from Jacobs. The investigation methodology was consistent with Australian Standard AS 1726-1993 (Geotechnical Site Investigations) and Jacobs' standard work procedures.

A total of 15 boreholes were drilled over the three sites at the proposed structure locations adjacent to corresponding CPTs.

The boreholes were drilled using a 4WD trailer mounted drilling rig which was supplied and operated by Civiltest Pty Ltd. All boreholes were located in the middle of the existing access tracks, except for those drilled at drop structure locations, and BCN-BH03, which was drilled to the north side of the access track embankment. The work was performed under the full-time supervision of cultural heritage representative from Mallee CMA.

The subsurface profile in each borehole was described and disturbed and undisturbed (U63 push tubes) soil samples were collected for laboratory testing. Where possible, shear vane tests were performed on the undisturbed soil samples to assess the in situ strength of the soils.

A summary of borehole details is presented in Table 4-2 and borehole logs are presented in Appendix B.

**Table 4-2 Summary of Borehole Information**

Test Pit ID	Proposed Structure	Adjacent CPT	Approximate Easting (m) <sup>1</sup>	Approximate Northing (m) <sup>1</sup>	Approximate Elevation (m AHD)	Final Depth (m bgl) <sup>2</sup>
<b>Burra Creek</b>						
BCN-BH01	B1	BCN-CPT01	711722	6136843	56.6	10.0
BCN-BH02	B1	BCN-CPT02	711728	6136836	56.8	10.0
BCN-BH03	B1	-	711727	6136848	56.2	8.0
BCN-BH04	Burra Drop Structure	-	712115	6136778	56.0	6.0
BCM-BH01	B2	BCN-CPT03	712145	6131922	59.0	8.0
BCM-BH02	B2	BCN-CPT04	712131	6131925	58.6	8.0
BCS-BH01	B4	BCS-CPT01	712751	6121986	61.9	8.0
<b>Nyah</b>						
NN-BH01	N2	NN-CPT03	714789	6112069	62.1	8.0
NN-BH02	Nyah Drop Structure	-	714949	6112164	61.0	6.0
NS-BH01	N5	NS-CPT01	716984	6107058	63.8	3.8 (Refusal)
<b>Vinifera</b>						
VN-BH01	V1	VN-CPT01	717396	6103597	63.5	5.0
VN-BH02	Vinifera Drop Structure	-	717340	6103976	63.5	9.0
VS-BH01	V3	VS-CPT01	720288	6101567	65.4	6.5 (Refusal)

Test Pit ID	Proposed Structure	Adjacent CPT	Approximate Easting (m) <sup>1</sup>	Approximate Northing (m) <sup>1</sup>	Approximate Elevation (m AHD) <sup>3</sup>	Final Depth (m bgl) <sup>2</sup>
<b>Burra Creek</b>						
VS-BH02	V3	VS-CPT03	720253	6101588	65.0	5.0 (Refusal)
VS-BH03	V4	VS-CPT04	720347	6102790	64.4	5.0

<sup>1</sup>: coordinates provided in WGS 84 54S

<sup>2</sup>: m bgl: metres below ground level

<sup>3</sup>:m AHD: metres Australian Height Datum

#### 4.4 Cone Penetration Testing Investigation

The CPT investigation was undertaken between 27 to 29 October 2014, with a total of 17 CPT probes conducted over the three sites by Black Insitu Testing. All CPT probes were performed at proposed structure locations and were located in the middle of the existing access tracks. This work was performed under the supervision of cultural heritage representative from Mallee CMA.

A summary of the CPT details is presented in Table 4-3 and the CPT results are presented in Error! Reference source not found..

**Table 4-3 Summary of CPT information**

Test Pit ID	Proposed Structure	Approximate Easting (m) <sup>1</sup>	Approximate Northing (m) <sup>1</sup>	Final Depth (m bgl) <sup>2</sup>
<b>Burra Creek</b>				
BCN-CPT01	B1	711722	6136843	6.22
BCN-CPT02		711728	6136836	2.96
BCN-CPT03	B2	712145	6131922	8.8
BCN-CPT04		712131	6131925	8.75
BCS-CPT01	B4	712751	6121986	8.84
BCS-CPT02		712754	6121993	8.77
<b>Nyah</b>				
NN-CPT01A	N1a	714653	6112254	4.92
NN-CPT02A	N1b	714704	6112160	5.50
NN-CPT03	N2	714789	6112069	6.95
NN-CPT04		714798	6112058	7.13
NS-CPT01	N5	716984	6107058	5.76
<b>Vinifera</b>				
VN-CPT01	V1	717196	6103831	5.52
VN-CPT02	V2	717395	6103596	8.4
VS-CPT01	V3	720288	6101567	7.47
VS-CPT02		720273	6101577	5.61
VS-CPT03		720253	6101588	7.45
VS-CPT04	V4	720347	6102790	5.45

<sup>1</sup>: coordinates provided in WGS 84 54S

<sup>2</sup>: m bgl: metres below ground level



## 4.5 Potential Borrow Locations

An initial limited investigation of external borrow sources was undertaken; bulk samples were collected to identify whether the material was appropriate for bank construction. A summary of the locations is presented below in Table 4-44.

**Table 4-4 Summary of potential borrow locations**

Location	Approximate Easting (m) <sup>1</sup>	Approximate Northing (m) <sup>1</sup>
Calcrete pit, Mallee Hwy, Piangil	692,560	6,117,885
Terry Benfield Property 4548 Murray Valley Hwy, Piangil	711,250	6,121,950
Shane Coburn Farm, Prentice Road, Koraleigh	723,335	6,104,005

Of the three potential borrow sites investigated, the first one (approximately 20km west of Piangil) represented an existing calcrete pit, with this material to be considered for use as beaching and capping material for the crest of the banks.

The Mawsons Quarry at Lake Boga (Quarry Rd, Kunat) which supplies granite rock, is another potential source for beaching.

The other two sites were investigated as potential sources of clay fill. Material from the second site (Terry Benfield's property) was previously used for the construction of access tracks in the State forests.

Bulk samples of the natural clay material at Nyah North (test pit NNTP04) and the fill material at Vinifera South (test pit VSTP05 at structure V3) were also collected and submitted for laboratory testing to assess their engineering properties, for potential borrow material.

## 5. Laboratory Testing

Geotechnical testing was performed on selected undisturbed and disturbed samples from the boreholes, test pits and borrow locations.

The samples from the geotechnical investigation in 2014 were tested by Civil Geotechnical Services in their NATA accredited laboratory in Croydon.

The samples collected from the subsequent geotechnical investigation in 2016 were sent to 'Civil Test' laboratories in Mildura, with tri-axial and hydrometer samples sent to 'Ground Science' Melbourne laboratory and 'Trilab' laboratory respectively. The testing program for both stages of investigation is summarised in Table 5-1.

A summary of the geotechnical laboratory testing results are provided in Table 5-2, Table 5-3 and Table 5-4 below and the laboratory certificates are provided in Error! Reference source not found..

**Table 5-1 Summary of Laboratory Testing**

Test Description	Applicable Australian Standard	No. of Tests
Visual Classification and Moisture Content	AS 1289.2.1.1	12
Atterberg Limits with Linear Shrinkage	AS 1289.3.1.2, 3.2.1, 3.3.1, 3.4.1	16
Particle Size Distribution (sieving – up to 2.36mm)	AS 1289.3.6.1	7
Particle Size Distribution (with hydrometer)	AS 1289.3.6.1 & AS1289.3.6.3	7
Emerson Class	AS 1289.3.8.1	20
Standard Compaction	AS 1289.5.1.1	1
Permeability (Undisturbed samples)	AS 1289.6.7.3	5
Shrink Swell Index	AS1289.7.1.1	2
Triaxial (Unconsolidated Undrained)	AS1289.6.4.1	5
Triaxial (Consolidated Undrained)	AS1289.6.4.2	1

**Table 5-2 Summary of Soil Classification Results**

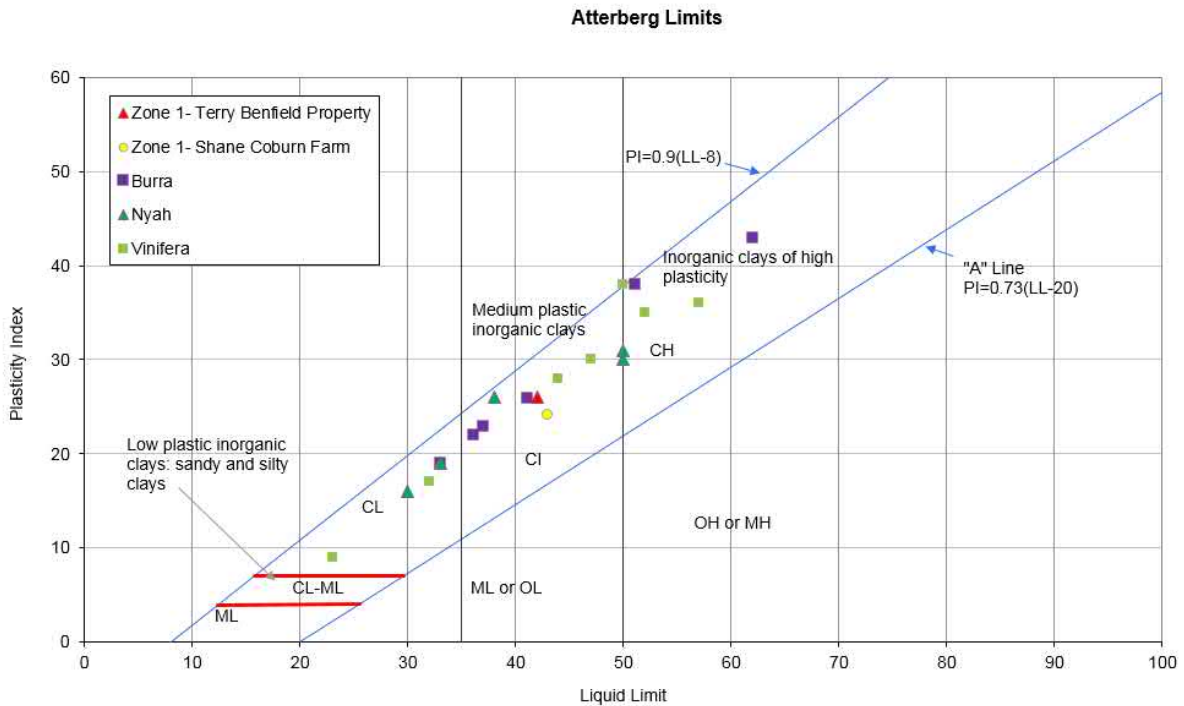
Location	Depth (m)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	% Fines	Emerson Class <sup>1</sup>	Emerson Class <sup>2</sup>	Permeability (m/s)
<b>Burra Creek</b>									
BCN-BH01	1.3-1.65	13.0	36	22	11.0	62	2	3	4 x 10 <sup>-11</sup>
	4.9	18.5	33	19	9.0	69	-	-	-
BCN-BH02	0.7-1.1	11.8	41	26	11.5	89	-	-	-
BCN-BH03	1.0-1.45	19.3	51	38	-	82	5	5	-
BCN-BH04	1.0-1.45	-	-	-	-	-	-	5	-
BCM-BH02	1.5-1.75	19.2	62	43	18.0	94	2	6	-
BCS-BH01	6.0-6.2	15.5	37	23	9.5	76	-	-	-
<b>Nyah</b>									
NN-BH01	1.9-2.15	23.4	50	31	14.0	98	3	5	7 x 10 <sup>-11</sup>
	4.3-4.7	18.4	-	-	-	-	-	-	-
NN-BH02	1.0-1.45	10.4	38	26	-	85	5	5	-
NS-BH01	1.5	8.4	30	16	7.5	70	-	-	-
NNTP04	1.5	20.7	50	30	13.0	98	3	5	-

Location	Depth (m)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	% Fines	Emerson Class <sup>1</sup>	Emerson Class <sup>2</sup>	Permeability (m/s)
Nyah- Murray River Bank 500m South-East of Sill 3.	River Bank	5.3	33	19	7	97	5	5	-
<b>Vinifera</b>									
VN-BH01	1.8-2.1	17.8	-	-	-	-	-	-	$2 \times 10^{-11}$
	3.5	5.9	23	9	4.5	32	4	4	-
	4.0-4.45	14.6	47	30	13.0	58	-	-	$3 \times 10^{-11}$
VN-BH02	1.5-1.95	-	-	-	-	-	-	5	-
VS-BH02	1.5-1.9	19.9	57	36	12.5	96	2	5	-
VS-BH03	0.8-1.25	16.3	44	28	11.5	-	-	-	$2 \times 10^{-10}$
VSTP05	0.0-2.00	10.1	32	17	8.5	40	4	4	-
VSTP07	0.7-1.3	15.4	52	35	-	91	2	2	-
VSTP12	0.6-1.5	18	50	38	-	94	5	5	-
<b>External Borrow Sites</b>									
Calcrete pit, Piangil	N/A	3.7	23	6	3.0	25	4	4	-
Terry Benfield Property		5.7	42	26	13	65	3	3	-
Shane Coburn Farm		6.8	43	24	11	78	3	3	-

<sup>1</sup> Emerson Class testing conducted in distilled water

<sup>2</sup> Emerson Class testing conducted with Murray River water

The Atterberg Limit test results are summarised on the Casagrande Chart, show in **Figure 2**.



**Figure 2 – SDL Adjustment Project Soil Plasticity Chart**

Table 5-3 Summary of Particle Size Distribution Results

Location	Depth (m)	Fine Material		Coarse Material	
		Clay (%)	Silt (%)	Sand (%)	Gravel (%)
<b>Burra Creek</b>					
BCN-BH01	1.3-1.65	29	25	21	25
	4.9	69		31	-
BCN-BH02	0.7-1.1	89		11	-
	1.5-1.75	94		5	1
BCN-BH03	1.0-1.45	43	39	18	-
	3.0-3.45	20	56	24	-
	4.5-4.95	15		85	-
	6.0-6.45	37	61	2	-
<b>Nyah</b>					
NN-BH01	1.9-2.15	46	50	4	-
NN-BH02	1.0-1.45	27	58	15	-
NS-BH01	1.5	27	28	45	-
NNTP04	1.5	56	39	5	-
Nyah- Murray River Bank 500m South-East of Sill 3.	River Bank	97		3	-
<b>Vlinifera</b>					
VS-BH01	3.5	17	10	69	4
	4-4.45	59		40	1
VS-BH02	1.5-1.9	96		4	-
VSTP05	0.0 – 2.0	23	13	60	4
VSTP07	0.7-1.3	47	44	9	-
VSTP12	0.6-1.5	94		6	-
<b>External Borrow Sites</b>					
Calcrete pit, Piangil	N/A	8	15	35	42
Terry Benfield Property		38	23	38	1
Shane Coburn Farm		38	36	26	-

Table 5-4 Summary of Standard Compaction Results

Location	Depth (m)	Field Moisture Content (%)	Maximum Dry Density (t/m <sup>3</sup> )	Optimum Moisture Content (%)
NNTP04	1.5	20.7	1.51	24.0
VSTP05	0.0 – 2.0	10.1	1.67	16.5
Calcrete pit, Piangil	N/A	3.7	1.94	12.0
Terry Benfield Property		5.7	1.66	18.0
Shane Coburn Farm		6.8	1.54	19.5

Table 5-5 Summary of Shrink-Swell, Unconsolidated Undrained

Location	Depth (m)	Moisture Content (%)	Dry Density (t/m <sup>3</sup> )	Shrink-Swell Index (I <sub>ss</sub> ) (%)	Undrained Shear Strength (kPa)
BCN-BH02	0.7-1.1	13.8	1.73	2.7	-
BCM-BH02	1.5-1.75	19.2	1.76	-	356
NN-BH01	1.9-2.15	23.4	1.59	-	151
	4.3-4.7	18.4	1.72	-	114
VS-BH02	1.5-1.9	19.9	1.68	-	548
VS-BH03	0.8-1.25	16.4	1.63	1.4	-
	3.0-3.25	15.6	1.83	-	397

## 6. Site Conditions

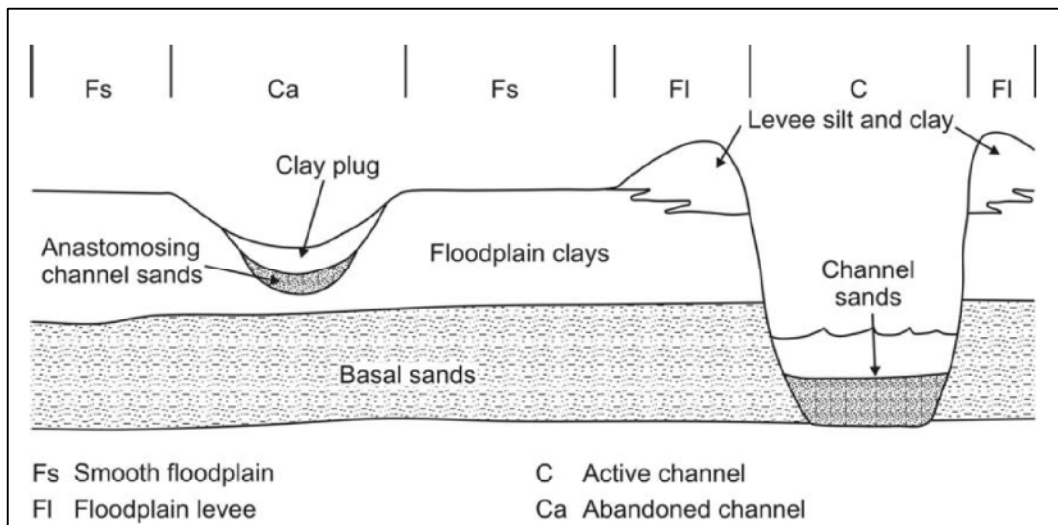
### 6.1 Summary of Geology

**Figure 3** is taken from Jacobs (2014a) – “Geology Study Report”. It helps place the floodplain land units in a geological stratigraphic context for the sites being assessed in this report.

In geological terms “Floodplain Clays” and “Clay plug” are inferred to be of the Coonambidgal Formation, while “Basal sands” are inferred to be Monoman Formation sands.

“Levee silt and clay” and “Channel sands” are inferred to be recent River Deposits.

Other deeper geological units are not shown.



**Figure 3 - Relationship between stratigraphic units, geomorphic units, and surface materials in the area between Wakool Junction and the southern boundary (Clarke et al 2008)**

The relationships between the geological formations and soil types encountered in this investigation is presented in **Figure 4** and descriptions of the materials encountered in each of the geological formations is summarised in Section 6.2.

### 6.2 Site Stratigraphy

The following section provides a description of the stratigraphic formations that were identified as part of the geological desktop study. The materials encountered during geotechnical investigations were generally consistent with these formations.

#### Recent floodplain deposits

This has formed within the period of European settlement or after the main floodplain silty clay sediment was laid down, within the last few thousand years. These soils tend to be shallow intermittent surface layers of mixed material types including thin layers of sands, sandy clays to clays. This layer, where present, is typically between 0.1 to 0.2m thick.

More commonly, the floodplain comprises up to approximately 0.2 m of the Coonambidgal formation as the surface layer.

### **Connambidgal Formation**

This formation is understood to have the following depositional phases:

- Whole coloured grey to brownish grey, clay phase
- Mottled clay phase
- Sandy clay to clayey sand phase

The Coonambidgal formation is further divided according to soil type and topographic location by Skene and Sargeant (1966). The subdivisions include:

- Donnington clay
- Fish Point clay
- Speewa clay
- Swan Hill clay
- Unit G
- Types 1 to 5

These subdivisions are discussed in relation to the project sites in Jacobs (2014a).

### **Monoman Formation**

This is a sandier geological unit than the overlying Coonambidgal formation and indicates a higher flow regime, or at least intermittent high flows depositing sand, where the clay component of river sediment (that is characteristic of the younger Connambidgal Formation) was largely flushed out to sea in suspension.

This sand may be related to the prior stream activity recorded elsewhere in the Murray Darling Basin where coarse to medium sands were the dominant channel fill in incised streams of various tributary rivers.

It is thought this was during glacial periods, when extensive snowmelt on the highlands caused floods to occur in spring or summer months. This would generally date to periods older than 12,000 years (or 12ka) and younger than 110,000 years (or 110ka) as presented in Page et al. (1991, 2009). These older sands have had time to consolidate and potentially become cemented as discussed below.

### **Blanchetown Clay**

This unit was encountered in Burra test pits BC-TP02 and BC-TP03 near structure B1. It was also intersected in boreholes BH02, BH05 and BH06 in Aitken Rowe (2012). The depth of intersection of this unit was between 2.1m and 6.2m below floodplain surface. It acts as an impervious layer (aquaclude) trapping groundwater in the underlying Loxton-Parilla Sands throughout the lower Murray-Darling Basin.

### **Loxton-Parilla Sands**

This unit was not encountered in the investigation test pits but was intersected in boreholes BH05 and BH06 (from Aitken Rowe, 2012) at regulator site V3. This unit, and the overlying Blanchetown clay, was encountered there because this regulator is near to the floodplain edge where older sediments are exposed in the original Murray River trench sides. These sands are the major source of regional deeper groundwater, including saline input into the Murray River and tributaries elsewhere, where this formation is shallowed by faulting and folding.

Table 6-1, Table 6-2 and Table 6-3 present summaries of the inferred stratigraphy in each of the test pits excavated as part of this investigation.

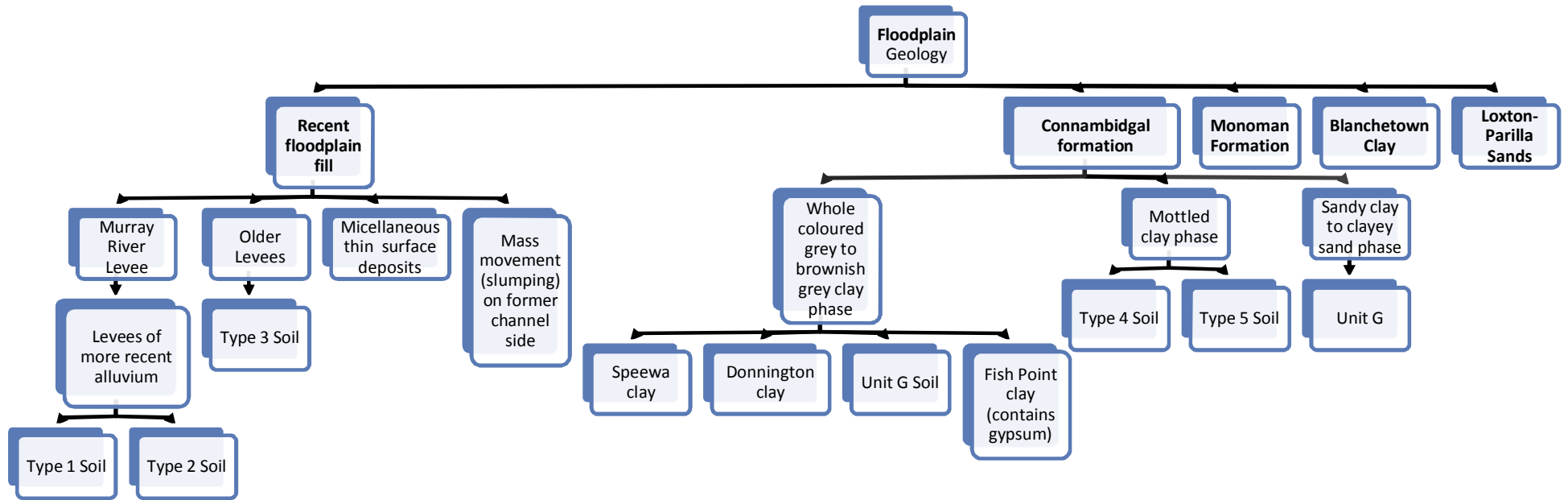


Figure 4 - Flow chart of association of the soils and sediment layers

### 6.3 Site Stratigraphy

The following section provides a description of the stratigraphic formations that were identified as part of the geological desktop study. The materials encountered during geotechnical investigations were generally consistent with these formations.

#### Recent floodplain deposits

This has formed within the period of European settlement or after the main floodplain silty clay sediment was laid down, within the last few thousand years. These soils tend to be shallow intermittent surface layers of mixed material types including thin layers of sands, sandy clays to clays. This layer, where present, is typically between 0.1 to 0.2m thick.

More commonly, the floodplain comprises up to approximately 0.2 m of the Coonambidgal formation as the surface layer.

#### Connambidgal Formation

This formation is understood to have the following depositional phases:

- Whole coloured grey to brownish grey, clay phase
- Mottled clay phase
- Sandy clay to clayey sand phase

The Coonambidgal formation is further divided according to soil type and topographic location by Skene and Sargeant (1966). The subdivisions include:

- Donnington clay
- Fish Point clay
- Speewa clay
- Swan Hill clay
- Unit G
- Types 1 to 5

These subdivisions are discussed in relation to the project sites in Jacobs (2014a).

#### Monoman Formation

This is a sandier geological unit than the overlying Coonambidgal formation and indicates a higher flow regime, or at least intermittent high flows depositing sand, where the clay component of river sediment (that is characteristic of the younger Connambidgal Formation) was largely flushed out to sea in suspension.

This sand may be related to the prior stream activity recorded elsewhere in the Murray Darling Basin where coarse to medium sands were the dominant channel fill in incised streams of various tributary rivers.

It is thought this was during glacial periods, when extensive snowmelt on the highlands caused floods to occur in spring or summer months. This would generally date to periods older than 12,000 years (or 12ka) and younger than 110,000 years (or 110ka) as presented in Page et al. (1991, 2009). These older sands have had time to consolidate and potentially become cemented as discussed below.

#### Blanchetown Clay

This unit was encountered in Burra test pits BC-TP02 and BC-TP03 near structure B1. It was also intersected in boreholes BH02, BH05 and BH06 in Aitken Rowe (2012). The depth of intersection of this unit was between 2.1m and 6.2m below floodplain surface. It acts as an impervious layer (aquaclude) trapping groundwater in the underlying Loxton-Parilla Sands throughout the lower Murray-Darling Basin.

#### Loxton-Parilla Sands

This unit was not encountered in the investigation test pits but was intersected in boreholes BH05 and BH06 (from Aitken Rowe, 2012) at regulator site V3. This unit, and the overlying Blanchetown clay, was encountered there because this regulator is near to the floodplain edge where older sediments are exposed in the original



Murray River trench sides. These sands are the major source of regional deeper groundwater, including saline input into the Murray River and tributaries elsewhere, where this formation is shallowed by faulting and folding.

**Table 6-1 Stratigraphy from Test Pits at Burra Creek**

Test Pit	Depth From (m bgl)	Depth To (m bgl) (EOH = Base of test pit)	Formation	Layer	Comments
BC TP01	0	0.3	-	Road Fill	Near to edge of floodplain where former river meander incised into the below formations.
	0.3	1.2	Coonambidgal Formation	Swan Hill Clay	
	1.2	2.4		Type 4 & 5 Soil	
	2.4	2.7+	Recent flood plain deposit-Channel sands	Sand	
BC TP02 (Creek bed about 2.3m below floodplain)	0	0.3	Blanchetown Clay	Dense mottled clay	
BC TP03	0	1.0	Coonambidgal Formation	Swan Hill Clay	
	1.0	1.4	Recent flood plain deposit-Channel sands	Sand	
	1.4	1.7	Blanchetown Clay	Mottled Clay	
	1.7	2.3 EOH		Dense mottled clay	
BC TP04	0	1.05 EOH		Swan Hill Clay	
BC TP05	0	0.15	Coonambidgal Formation	Levees of more recent alluvium (Type 3 soil)	
	0.15	1.0		Mottled clay phase	
	1.0	1.5 EOH		Clayey Sand	
BC TP06	0	0.15	Coonambidgal Formation	Levees of more recent alluvium (Type 3 soil)	
	0.15	1.9 EOH		Swan Hill Clay	
BC TP07	0	0.8	Coonambidgal Formation	Swan Hill Clay	
	0.8	1.205 EOH	Blanchetown Clay	Mottled clay	
BC TP08	0	0.15	-	Road Fill	
	0.15	1.0 EOH	Coonambidgal Formation	Speewa Clay	
BC TP09	0	0.2	Coonambidgal Formation	Levees of more recent alluvium (Type 3 soil)	Old cut-off channel fill
	0.2	1.0 EOH		Swan Hill Clay	Thin levee deposit of the present Murray River Brown lower horizon characteristic
BC TP10	0	0.2	Coonambidgal Formation	Levees of more recent alluvium (Type 3 soil)	Thin levee deposit of the present Murray River
	0.2	1.0 EOH		Speewa Clay	Dark clay, no mottle above 1m
BC TP11	0	0.35	Coonambidgal Formation	Levees of more recent alluvium (Type 3 soil)	Thin levee deposit of the present Murray River
	0.35	1.0 EOH		Speewa Clay	Dark clay, no mottle above 1m
BC TP12	0	0.7	Engineered Levee Fill	Clay (see test pit log)	Artificial levee for irrigation channel
	0.7	2.3	Coonambidgal Formation	Speewa Clay	Dark clay, no mottle above 1m. Old channel fill.
	2.3	2.7 EOH	Blanchetown Clay	-	Indicated by reddish grey mottles
BC TP13	0	1.6	Engineered Levee Fill	Clay (see test pit log)	Artificial levee for irrigation channel
	1.6	2.7 EOH	Coonambidgal Formation	Speewa Clay	Dark clay, no mottle above 1m
<b>Far Southern End – near Tooleybuc</b>					
BC TP14	0	0.2	Road fill	Clay (see test pit log)	Northern end of culvert near gate
	0.2	2.7 EOH	Coonambidgal Formation	Speewa Clay	
BC TP15	0	0.1	Present creek bed sediment	-	Sandy
BC TP16	0	0.3	Road fill	Clay (see test pit log)	Nar southern end on culvert
	0.3	0.7		Donnington clay	Brown clay, no mottles
	0.7	2.8 EOH	Coonambidgal Formation	Fish Point Clay	Contains gypsum crystals below 2.6m. May be drying phase of ancient cut-off lagoon or lake. Possibly top of Blanchetown clay.

Table 6-2 Stratigraphy from Test Pits at Nyah

Test Pit	Depth From (m BSL)	Depth To (m BSL) (EOH - Base of test pit)	Formation	Layer	Comments	
NN TP01	0	0.2	Coonambidgal Formation	Type 4 soil	Alluvium layer of light brown silty sand.	
	0.2	1.2 EOH			Grey brown and yellow brown mottled silty sandy clay. With carbonate nodules 0.7m Gilgai holes.	
NN TP02	0	0.4		Type 3 soil	Alluvium	
	0.4	1.0 EOH			Old surface - old meander channel fill.	
NN TP03	0	0.2		Road fill		
NN TP03	0.2	0.4		Coonambidgal Formation	Type 3 soil	Mottled grey brown clay
	0.4	1.0 EOH	Grey whole coloured clay			
NN TP04	0	1.8	Old Channel fill			Mottled clay
	1.8	2.0				Silt
	2.0	2.7 EOH			Mottled clay	
NN TP05	0	0.2	Road fill			
NN TP05	0.2	1.0 EOH	Coonambidgal Formation	Type 3 soil		
	NN TP06	0		1.2 EOH	Old Channel fill	Mottled clay
NN TP07	0	2.85 EOH		Old Channel fill of Swan Hill Clay	Mottled clay. Excavator bucket refused at 2.85m (test pit abandoned).	
NN TP08	0	1.0m EOH		Speewa clay		
NN TP09	0	0.2		Road fill	-	
NN TP09	0.2	1.0 EOH		Coonambidgal Formation	Swan Hill clay	Clay with red brown mottles
NS TP01	0	2.7 EOH	Swan Hill clay		Reddish then yellow mottled clay	
NS TP02	0	2.6 EOH	Swan Hill clay		Some layering.	
NS TP03	0	0.3	Swan Hill clay		Creek bed between NS TP01 and 02.	

Table 6-3 Stratigraphy from Test Pits at Vinifera

Test Pit	Depth From (m BSL)	Depth To (m BSL) (EOH - Base of test pit)	Formation	Layer	Comments	
VN TP01	0	1.0m EOH	Coonambidgal Formation	Speewa clay	Dark grey clay to 1m, no mottle.	
VN TP02	0	0.05		Topsoil		
	0.05	1.6		Type 3 soil (old levee)	Clay, mottled mid grey & yellow brown.	
	1.6	1.8 EOH			Grey brown clay.	
VN TP03	0	0.3		Topsoil		
	0.3	1.2		Old levee deposit over Speewa clay	Clay, mottled grey brown and yellow brown along cracks.	
VN TP03	1.2	2.2 EOH		Clay, mid grey whole coloured		
	VN TP04	0	1.0 EOH	Speewa clay		
VS TP01	0	0.4	Fill			
	0.4	2.3 EOH	Coonambidgal Formation	Speewa clay	Former channel fill	
VS TP02	0	0.8		Type 5 soil	Mottled grey brown and red brown clay.	
	0.8	2.7 EOH			whole coloured grey clay	
VS TP03	0	0.3		Creek bed		
VS TP04	0	0.6		Unit G soils (floodplain edge)		Mottled grey and red brown clay.
	0.6	1.0 EOH				Sandy clay, grey and some red brown mottle with carbonate in cracks.
VS TP05	0	2.0 EOH	Fill	Regulator fill		
VS TP06	0	0.6	Coonambidgal Formation	Old channel fill	Silty sand dark with humus.	
	0.6	1.0			Sandy clay dark grey. Black	

					clay at 1.0m.
VS TP07	0	1.5	Coonambidgal Formation	Embankment Fill	Silty CLAY material generally, with a layer of sandy CLAY at 0.5-0.6m
VS TP08	0	0.2		Topsoil	
	0.2	1.7		Type 5 soil	Silty CLAY, grey. Roots observed to 0.7m depth
VS TP09	0	0.2		Topsoil	
	0.2	1.6		Type 5 soil	Silty CLAY, grey. Roots observed to 0.7m depth
VS TP10	0	0.4		Topsoil	
	0.4	1.5		Speewa clay	Silty CLAY, refusal at 0.7m
VS TP11	0	0.4		Topsoil	
	0.4	1.7		Speewa clay	Silty CLAY, brown grey, becoming orange, grey
VS TP12	0	0.4		Topsoil, Creek Bed	Creek bed
	0.4	1.5		Speewa clay	stiff Silty CLAY, brown becoming dark grey
VS TP13	0	0.1		Topsoil	
	0.1	1.6		Speewa clay	Silty CLAY, grey, brown
VS TP14	0	0.2		Topsoil	
	0.2	1.4	Speewa clay	Silty CLAY, brown becoming dark grey	

## 6.4 Cemented Horizons

Geological and soil studies throughout the region have recorded hardened and cemented soil horizons due to the precipitation of iron oxides, calcium sulphate (gypsum), silica (hardpans and silcrete) and carbonates (calcrete, bush limestone).

The CPT and test pit investigations have revealed two intermittent cemented horizons. A shallow horizon was encountered at approximately 2.6 and 3.0m and a deeper horizon was encountered between approximately 5.6 m and 7.5 m.

Cemented material was inferred from either refusal of the excavator bucket or refusal of the CPT probe. Harder (but not cemented) horizons were inferred from a sharp increase in the CPT cone resistance. The cemented and semi-cemented layers inferred from the CPT testing are summarised in Table 6-4 below.

**Table 6-4 Cemented and semi-cemented layers inferred from CPT testing**

Location	Structure	CPT	Final CPT Depth (m bgl)	CEMENTED LAYERS		HARDENED (Semi-cemented) LAYERS	
				Deep Refusal Depth (m bgl)	Shallow Refusal Depth (m bgl)	Deeper Denser Layer (m bgl)	Shallow Denser Layer (m bgl)
Burra Creek	B1	BCN-CPT01	6.22	6.22	-	-	2.6
		BCN-CPT02	2.96	-	2.96	-	-
	B2	BCN-CPT03	8.80	-	-	-	3.54
		BCN-CPT04	8.75	-	-	6.94	2.29
	B4	BCS-CPT01	8.84	-	-	6.97	3.75
BCS-CPT02		8.77	-	-	-	1.47	
Nyah	N1a	NN-CPT01	2.62	-	2.62	-	-
		NN-CPT02	5.81	-	-	-	-
	N2	NN-CPT03	6.95	6.95	-	-	-
		NN-CPT04	7.13	7.13	-	-	-
		NS-CPT01	5.76	5.76	-	-	-
Vinifera	V1	VN-CPT01	5.52	-	-	-	-

	V2	VN-CPT02	8.40		-	5.9	-
	V3	VS-CPT01	7.47	7.47	-	2.9	0.7
		VS-CPT02	5.61	5.61	-	-	-
		VS-CPT03	7.45	7.45	-	4.4	3.5
	V4	VS-CPT04	5.45	5.45	-	-	1.1

## 6.5 Groundwater

Perched groundwater tables appear to be related to these cemented or denser horizons. The water table was deeper than the depths investigated as part of the test pit investigations and was only encountered during the CPT and borehole investigations.

The groundwater level was measured after each of the boreholes were drilled where possible. No groundwater was encountered in the boreholes drilled at the regulator structure locations at Nyah and Vinifera. A summary of the groundwater observations at Burra Creek in terms of groundwater elevation and depth to groundwater are summarised in Table 6-5.

**Table 6-5 Summary of Groundwater at Burra Creek**

Test Pit ID	Proposed Structure	Approximate borehole Surface Elevation (m AHD)	GW Depth (m bgl)	GW Elevation (m AHD)	Final Borehole Depth (m bgl)
BCN-BH01	B1	56.6	4.7	51.9	10.0
BCN-BH02		56.8	5.2	51.6	10.0
BCN-BH03		56.2	4	52.2	8.0
BCN-BH04	Burra Drop Structure	56.0	5.6	50.4	6.5
BCM-BH01	B2	59.0	Not Encountered	Not Encountered	8.0
BCM-BH02		58.6	6.3	52.3	8.0
BCS-BH01	B4	61.9	Not Encountered	Not Encountered	8.0

## 6.6 Soil Erosion

Soil tunnel erosion was observed among gilgai depressions near and throughout the northern half of the Nyah floodplain.

Figure 5 presents a photograph of the surface appearance of a “crabhole” gilgai near test pit NNTP01, which indicates dispersive and expansive soil.

Emerson Class results for the natural clay soils ranged from 2 to 5 when tested with distilled water (analogous to rain water) which indicates these soils have potential for dispersion in their existing and remoulded states. The clay soils typically exhibited less potential for dispersion when tested with water from the Murray River.

As the clay soils exhibit dispersive characteristics, these properties should be considered in design and construction to avoid piping under the constructed bank and regulator structures.



Figure 5 - Soil Tunnel Erosion at Nyah North

## 7. Structures and Banks

### 7.1 General

The following points should be considered for the sites where new banks and structures are proposed.

- **Uncontrolled fill:** Uncontrolled fill forms the majority of the existing access track embankments at the proposed structure locations and it is assumed all such material will be removed during construction.
- **Soil profile:** The soil profile at each site varies. Descriptions of each site in the proceeding sections, as well as test pit and borehole logs should be referred to.
- **Reactive / expansive clays:** Samples collected at site had a Liquid Limit range of results between 23% and 62%. Fissuring was noted in the high plasticity clay profile within the test pits, which indicates a potentially expansive clay soil profile. Expansive clays are more prone to wet-dry cracking and expansion.

**Dispersive soils:** The clay soils exhibited dispersive properties as outlined in Section 6.6. The clay soils were typically dry of optimum moisture content (OMC) which indicates moisture conditioning (wetting), as well as an appropriate level of compaction is required during preparation of the bank and structure foundations, as dry soils are generally more prone to dispersion. It is also recommended that a crest capping layer of granular (non-plastic) material should be included to protect against moisture loss and the development of crest surface cracking, which could act as a pathway for piping to initiate. Further measures should be considered during design of structures to prevent piping, including the use of cut-offs and filters.

Proper construction techniques to reduce the likelihood of piping should also be adopted, including; foundation excavation inspections and preparation, involving removing any desiccation cracking, defects, sand layers, proper moisture conditioning and compaction.

- **Cemented / hard layers:** Relatively shallow CPT and borehole refusal occurred at several locations, which may indicate cemented soil horizons (as discussed in Section 6.4). This should be considered for any proposed excavation or sheet piling at these locations.
- **Borrow materials:** An initial limited investigation of external borrow sources indicates the clay material tested is considered suitable for use for construction of banks subject to appropriate moisture conditioning and compaction control.

Following discussions with landowners, it is recommended that a further borrow source investigation and laboratory testing is undertaken at each proposed borrow site, in order to determine the quantity and characteristic properties of materials and mark out the extent of boundaries of suitable materials for construction use.

- **Groundwater:** Groundwater was encountered during the borehole and CPT investigations as noted in Section 6.5 and based on the recorded groundwater depths it is not anticipated groundwater will impact construction of the proposed structures, although groundwater levels may rise following periods of prolonged rainfall or inundation. It is assumed that coffer dams or other surface water control measures will be implemented during construction of any on-stream structures.

### 7.2 Burra Creek

#### 7.2.1 Banks

The existing access track embankments consist of fill material, which is to be removed as part of construction.

The underlying natural soil profile across the Burra site generally comprises topsoil observed up to 0.35m deep, overlying medium to high plasticity clay soils (silty/ sandy clays) of stiff to hard consistency, with layers of dense clayey SAND in some areas. Fissuring and slickensides were generally observed in clay material, as well as roots were observed in some test pits.



The clay soils exhibited dispersive properties when tested with distilled water. Soils typically exhibited less potential for dispersion when tested with water from the Murray River. The clay soils were typically dry of optimum moisture content (OMC) which indicates moisture conditioning (wetting) is required during preparation of the foundation.

The concept design cost estimates should include allowance for stripping of topsoil and bulk excavation of fill material.

## 7.2.2 Regulator Structures

### Structure B1

The soil profile at B1 structure location is shown on cross section- Figure E1 provided in Appendix E.

In general the founding soils are expected to comprise stratified alluvial sandy soils with a silty clay capping.

The subsurface materials at the B1 structure site generally comprise:

Unit	Material Type	Consistency	Depth Range (m)		
			BCN-BH01	BCN-BH02	BCN-BH03
1	Access track Fill: Silty CLAY, with fine sand.	Very stiff	0 to 0.3	0 to 0.3	-
2	Silty CLAY to sandy CLAY, intermediate to high plasticity.	Stiff to very stiff	0.3 to 6.4	0.3 to 4.5	0 to 2.5
3	Clayey SAND to SAND with clay, or silty SAND/ sandy SILT. Fine to medium grained sand, low plasticity fines.	Medium dense to dense	6.4 to 9.2	4.5 to 9.8	2.5 to 8.0
4	Sandy CLAY intermediate plasticity, fine grained sand.	Stiff	9.2 to 10.0	9.8 to 10.0	-

-' Not Encountered

The ground conditions encountered show that, the B1 structure foundations will sit on Silty CLAY to sandy CLAY material (Unit 2). This is the case, given that the existing access track embankment will be excavated out to form the foundation base.

Underlying Unit 2 are layers of clayey SAND to SAND with clay (Unit 3), which is prone to foundation backward erosion piping. It is therefore recommended that sheet piles are installed to act as a foundation seepage cut-off.

It is also recommended that the sheet piles extend through the B1 structure embankment to above the design water level. This measure is recommended to act as a barrier to piping erosion through the embankment; particularly given that the type of construction materials available may be moderately dispersive.

It should be noted that CPT refusal was encountered at a depth of 2.96m (RL 53.7) at location BCN-CPT02 and this may be indicative of a cemented horizon, which could act to be restrictive for driving of sheet piles at this location.

A tri-axial test; Consolidated Undrained test with pore pressure measurements, was undertaken to assist in the determination of drained design parameters, for assessing the structure in sliding stability. The results of the

test are presented in Appendix D. It should be noted that the test confining pressures were higher than might be expected for the structure on site.

### Structure B2

The geotechnical investigations were conducted on the alignment of the existing embankment, which crosses the existing creek bed, as well as on the existing approach track. The investigations consisted of:

- Two Test Pits, 2.7m and 2.8m, located on the approach track
- Two CPT's to 8.8m and 8.75m located on the bank
- Two Boreholes to 8.0m located next to the CPT's

The boreholes and test pits showed that the existing embankment, consisted of uncontrolled fill (silty sandy clay) with at least 2.8m depth of this material encountered at test pit BCTP13.

The natural soil profile can be inferred from boreholes BCM-BH01 and BCM-BH02 to comprise very stiff, high plasticity silty clay.

Groundwater was encountered at a depth of 5.4m in borehole BCM-BH02 during the investigation, with no groundwater encountered in borehole BCM-BH01 over the same period.

### Structure B4

The soil profile at structure B4 comprises very stiff to hard, medium plasticity silty clay overlain by 0.3m of uncontrolled clayey silt fill as presented in borehole BCS-BH01.

The test pits and CPT probes performed at this location also indicated an upper profile of potentially sandy material (fill/natural) to an approximate depth of 1.5m. No groundwater was encountered during the investigation period.

The concept design cost estimates are to allow for bulk excavation of the potentially sandy material as well as stripping of topsoil.

#### 7.2.3 Drop Structure

Borehole BCN-BH04 was drilled at Burra drop structure, at a location as shown in Appendix A. A photograph of the borehole setup location is also shown in Appendix B.

The borehole indicates that the soil profile to approximately 4.5 m depth generally consists of stiff sandy CLAY/ silty CLAY of low to intermediate plasticity, dry to moist. Below this the soil is variable, with layers of soft to firm silty CLAY and loose wet SAND encountered below the water table at 5.6m depth (RL 50.4). A laboratory test taken on a sample at 1.0-1.45m depth in BCN-BH04, had an Emerson Class 5, which indicates less erodible characteristics.

## 7.3 Nyah

### 7.3.1 Banks

#### Main Bank: between high ground at Sill 1 to high ground at Sill 3

Based on the results of the test pit investigations we expect that the proposed banks for Nyah will be founded on natural clay soils (silty/sandy clays) of high plasticity generally of stiff to very stiff consistency.



Some fill material was encountered at several locations. The fill typically comprised road base or previous embankment fill up to 0.2m deep. Topsoil material (silty sand) up to 0.2m deep was also encountered at several investigation locations.

At Nyah North, large erosion holes were noted adjacent to test pit NNTP01 as discussed in Section 6.6, with this being indicative of potentially highly dispersive soils.

The concept design cost estimates should include allowance for stripping of topsoil and bulk excavation of fill material. During detailed design, consideration will need to be given to the treatment of dispersive soils or incorporation of defensive design elements such as cut-offs and filters, to mitigate the risk of piping through the bank or structure foundations.

### **Natural Levee adjacent to Murray River**

Along the top of the Murray River banks exists a naturally formed 'levee', or raised ground profile. Inherent to the concept design is the utilisation of this natural 'levee' to store water. Throughout most of the Nyah site this natural 'levee' is several meters, up to tens of metres thick. However within the Nyah site approximately 500m south-east of Sill 3, there exists a section (approx. 150m long) where the natural 'levee' is around 1 to 2m thick. A track was noted approximately 3m back from the natural 'levee' bank at this location.

A site inspection and field survey was undertaken at this thinner section of natural 'levee' in Nyah. A soil classification log of the Murray River bank and laboratory testing of samples was also undertaken at this location.

Results show that the river bank was near vertical and approximately 4m high to water surface at the time of investigation. Soils were; firm to stiff, Silty CLAY, low plasticity with trace fine sand. Eucalyptus tree roots were observed throughout the bank. For this thinner section of the natural 'levee' bank; it is recommended that a full height bank (design water level plus freeboard) is constructed set back from the natural 'levee' and ties into high ground either side, where the natural 'levee' is thicker.

### **7.3.2 Regulator Structures**

#### **Structure N1a**

The soil profile at structure N1a comprises firm to stiff silty clay of medium to high plasticity. A layer of soft clayey silt was encountered at a depth of 1.8m in test pit NNTP04 and this material should be removed if it is within the zone of influence of the structure foundations.

CPT refusal was encountered at a depth of 2.62m at location NN-CPT01 and this may be indicative of a cemented horizon, the CPT also indicates medium dense clayey sands and sands from approximately 3.5 to 4.8m depth.

During detailed design, consideration will need to be given to the potential impact of the layer of clayey silt on the proposed design. The proposed structure is relatively low height and the proposed clay seepage cut-off trench could be located to extend through this layer.

#### **Structure N1b**

The soil profile at structure N1b comprises 0.2m of uncontrolled fill (road base), overlying firm to stiff silty clay of medium plasticity.

The concept design cost estimates should include allowance for stripping of topsoil and bulk excavation of fill material.

### **Structure N2**

The soil profile at structure N2 comprises 0.3m of uncontrolled fill (road base) overlying, stiff to very stiff silty clay of high plasticity. A layer of clayey sand of dense consistency was encountered at 7.0m depth.

The concept design cost estimates are to include allowance for stripping of topsoil and bulk excavation of fill material.

### **Structure N5**

The soil profile at structure N5 comprises 0.9m depth of uncontrolled fill (road base), overlying very stiff to hard silty clay/ silty sandy clay of low to high plasticity. Borehole refusal was encountered at a depth of 3.8m at borehole NS-BH01 and this may be indicative of a cemented horizon.

The Aitken Rowe (2012) investigation undertook BH2 which was drilled near to the N5 structure site, to a depth of 6.0m without refusal. It showed a similar ground profile to that described above to a depth of 2.8m, which was shown to overlie material described as silty clayey SAND and sandy silty CLAY of medium dense and very stiff to hard consistency respectfully.

The concept design cost estimates are to include allowance for stripping of topsoil and bulk excavation of fill material.

### **7.3.3 Drop Structure**

Borehole NN-BH02 was drilled at Nyah drop structure, at a location as shown in Appendix A. A photograph of the borehole setup location is also shown in Appendix B.

The borehole indicates that in the upper portion (top 4m depth); the soil profile, generally consists of stiff to very stiff sandy CLAY of low plasticity, dry to moist. The soil becomes variable below this, varying between soft to stiff silty CLAY and medium dense silty SAND. A laboratory test taken on a sample at 1.0-1.45m depth in NN-BH02, had an Emerson Class 5, which indicates less erodible characteristics.

## **7.4 Vinifera**

### **7.4.1 Banks**

#### **Vinifera North**

The proposed banks for North Vinifera site will be founded on natural clay soils of intermediate to high plasticity, with the soil profile encountered at the test pit locations generally of stiff to very stiff consistency. Topsoil was observed up to 0.3m depth.

The concept design cost estimates should include allowance for stripping of topsoil and bulk excavation of fill material.

#### **Vinifera South**

The proposed bank for South Vinifera site (between V3 and V4 structures) will be constructed along the existing access track alignment.

Test pits show the soil profile generally consisted of topsoil 0.2 to 0.4m thick (noting that roots were observed to 0.7m deep in VS-TP9) overlying stiff silty CLAY of intermediate to high plasticity. Towards the V3 structure the access track runs along an existing inferred engineered fill embankment (fill placed and compacted in layers, as opposed to dumped fill).

Test Pit VS-TP07 was excavated through the existing embankment (on the South West side of the access track), and results showed the embankment consisted of silty CLAY and sandy CLAY of low to intermediate plasticity. DCP results showed the top 200mm of fill had 3 blows per 100mm, and below this between 6 to 15 blows per 100mm, indicating very stiff to hard consistency. Embankment materials were observed to be dry which makes the material more prone to dispersion and tests showed the material to have an Emerson Class 2 (dispersive) with both distilled and Murray River water.

It is recommended that:

- During construction phase further investigations are undertaken to assess the existing embankment's variability;
- Concept design cost estimates are to include contingency for replacement of sections of the bank if required;
- 3H:1V batters are constructed, requiring stripping, moisture conditioning and compaction of appropriate materials on embankment shoulders; and
- A well graded crushed rock capping layer of at least 150mm thick is placed on top of the embankment across its full width, to limit any possible desiccation cracking.

#### 7.4.2 Regulator Structures

##### Structure V1

The soil profile at structure V1 comprises, 0.3m of uncontrolled fill (road base), overlying; very stiff to hard clay of high plasticity.

The concept design cost estimates should include allowance for stripping of topsoil and bulk excavation of fill material.

##### Structure V2

The soil profile at structure V2 comprises 0.3m of topsoil material (clayey), overlying; stiff to very stiff clay of medium to high plasticity. The CPT probe performed at this location (VN-CPT02) indicated medium dense to dense clayey sand / sandy clay soil at an approximate depth of 5.6m.

Further information on the soil profile at this location is also presented on the borehole log for BH4 in Aitken Rowe (2012).

The concept design cost estimates should include allowance for stripping of topsoil and bulk excavation of fill material.

##### Structure V3

Structure V3 is located at a creek bed. At this location there is an existing embankment that has been constructed approximately 2.5 to 3m high above natural ground level, at its highest point.

The ground profile at V3 structure is inferred from descriptions from boreholes VS-BH01 & BH02, and Aitken Rowe BH5 & 6, and generally consists of:

- **FILL:** Existing embankment fill at this location comprises uncontrolled fill including clay, sand and building rubble, of soft to firm consistency.

It has previously been reported that leakage through this embankment has been observed under high water levels. The extent of the uncontrolled fill is generally within the deepest sections; heading along the existing embankment towards the North, the embankment appears to become an engineered fill bank of stiff silty CLAY. This overlies;

- **Clayey SAND,** fine to coarse grained, dense, low to medium plasticity fines. This layer is shown in VS-BH01 and could consist of the base of the existing embankment fill. Overlying;

- **Silty CLAY/ sandy CLAY**, medium plasticity, firm to very stiff. This layer is within the natural ground profile and overlies;
- **Silty Clayey SAND**, fine to coarse grained with low plasticity fines. This layer is shown in Aitken Rowe BH5 & 6.

The concept designs should include provision for removal of the existing embankment and construction of a new embankment. The concept design should also provide for a foundation clay cut off that extends to a depth greater than the Clayey SAND layer observed in VS-BH01.

The 'Aitken Rowe 2012' Report shows that laboratory test results on samples taken of the Silty Clayey SAND layer observed in BH5 & 6 had fines content of 36-37%, liquid limits of 25-29% and Plasticity Index of 13-16%. Given this, it appears that the foundation would not likely be subject to backward erosion piping, which applies to cohesion less (non-plastic) soils.

#### **Structure V4**

The soil profile at structure V4 comprises firm to very stiff clay of medium to high plasticity overlain by up to 0.4m of uncontrolled fill material (clay/clayey silt). The CPT probe performed at this location (VS-CPT04) indicates generally sandy clay between 0.5m to 2.0m depth.

The concept design cost estimates are to include allowance for stripping of topsoil and bulk excavation of unsuitable materials.

#### **7.4.3 Drop Structure**

The site of the drop structure at Vinifera consists of a dry natural channel that is approximately 3m deep near the confluence with the Murray River. Due to site access constraints, borehole VN-BH02 was not drilled at the channel invert, instead it was drilled on high ground to the immediate north side of the natural channel. The borehole location is shown in Appendix A. A photograph of the borehole setup location is shown in Appendix B.

The borehole shows that the soil profile generally consists of stiff to very stiff silty CLAY with sand, of low to intermediate plasticity, dry to moist. This becomes firm sandy CLAY, of intermediate plasticity and moist at a depth of 7m. A laboratory test taken on a sample at 1.5-1.95m depth in VN-BH02, had an Emerson Class 5, which indicates less erodible characteristics.

## 8. References

- Aitken Rowe (2012). Geotechnical Investigation – Nyah & Vinifera Water Management Options, Nyah & Vinifera, Vic, Registration No: GS12-43, 31 July 2012.
- Clarke, J.D.A., V. Wong, C. F. Pain, H. Apps, D. Gibson, J. Luckman and K. Lawrie (2008). River Murray Corridor (RMC) in SE Australia - Geomorphology and surface materials; Boundary Bend to Nyah CRC LEME Open File Report 243, Cooperative Research Centre for Landscape Evolution and Mineral Exploration, Canberra, December 2008.
- Jacobs (2016a). SDL Adjustment Supply Measures –Concept Design for structures at Nyah, Vinifera and Burra Creek - Geological Desktop Review.
- Page, K.J., Kemp, J. and Nanson, G.C. (2009). Late Quaternary evolution of Riverine Plain palaeochannels, south-eastern Australia. *Australian Journal of Earth Sciences* 56: S19–S33.
- Page, K.J., Nanson, G.C. and Price, D.M. (1991). Thermoluminescence chronology of Late Quaternary deposition on the Riverine Plain of south-eastern Australia. *Australian Geographer* 22: 14–23.

## Appendix A. Investigation Location Plans



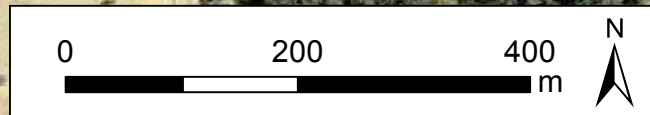
711500

712000

712500

713000

# Burra Creek North



## Legend

- Test Pits
- Proposed Structures
- Sills
- Proposed Levee

**Structure B1**  
 CPTs  
 -BCN-CPT01  
 -BCN-CPT02  
 Boreholes  
 -BCN-BH01  
 -BCN-BH02  
 -BCN-BH03

Burra Drop Structure  
 Boreholes  
 -BCN-BH04

**SILL 1**  
 EL 58.80m  
 15m LONG

**SILL 2**  
 EL 58.80m  
 20m LONG

**SILL 3**  
 EL 58.80m  
 350m LONG

BC-TP01  
 BC-TP02 (Spade Sample)  
 BC-TP03

BC-TP04

BC-TP05

BC-TP06

BC-TP07

BC-TP08

BC-TP09

BC-TP10

BC-TP11

6136500

6136500

6136000

6136000

6135500

6135500

6135000

6135000

6134500

6134500

711500

712000

712500

713000



# Burra Creek Mid

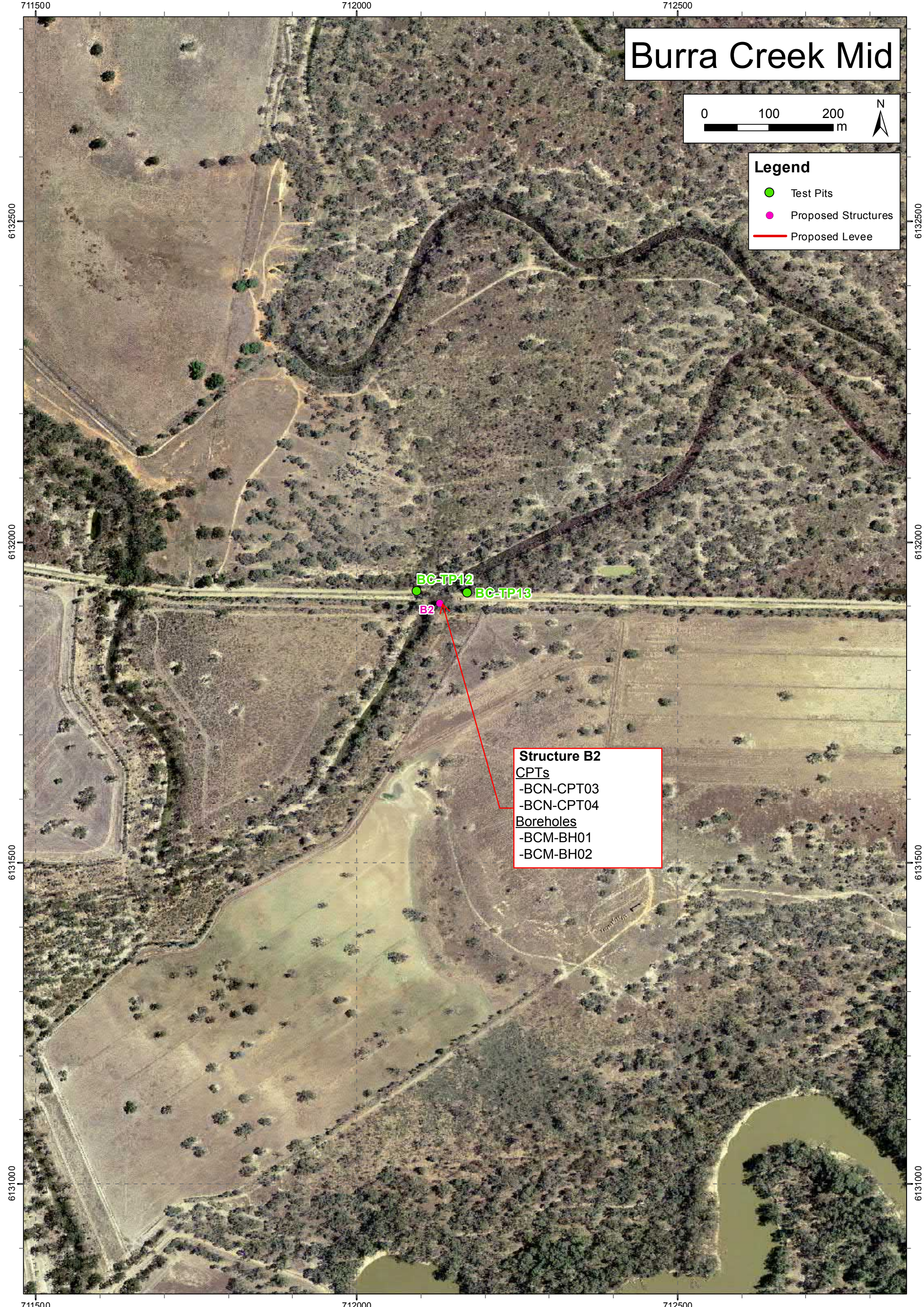


**Legend**

- Test Pits
- Proposed Structures
- Proposed Levee

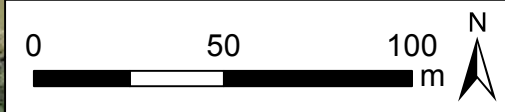
BC-TP12  
BC-TP13  
B2

**Structure B2**  
CPTs  
-BCN-CPT03  
-BCN-CPT04  
Boreholes  
-BCM-BH01  
-BCM-BH02





# Burra Creek South



**Legend**

- Test Pits
- Proposed Structures
- Proposed Levee

**Structure B4**  
CPTs  
 -BCS-CPT01  
 -BCS-CPT02  
Boreholes  
 -BCS-BH01

● BC-TP14  
● B4 BC-TP15 (Spade Sample)  
● BC-TP16

6122000

6122000



714000

715000

# Nyah North

0 25 50 100  
m



## Legend

- Test Pits
- Proposed Structures
- Proposed Levee

6113000

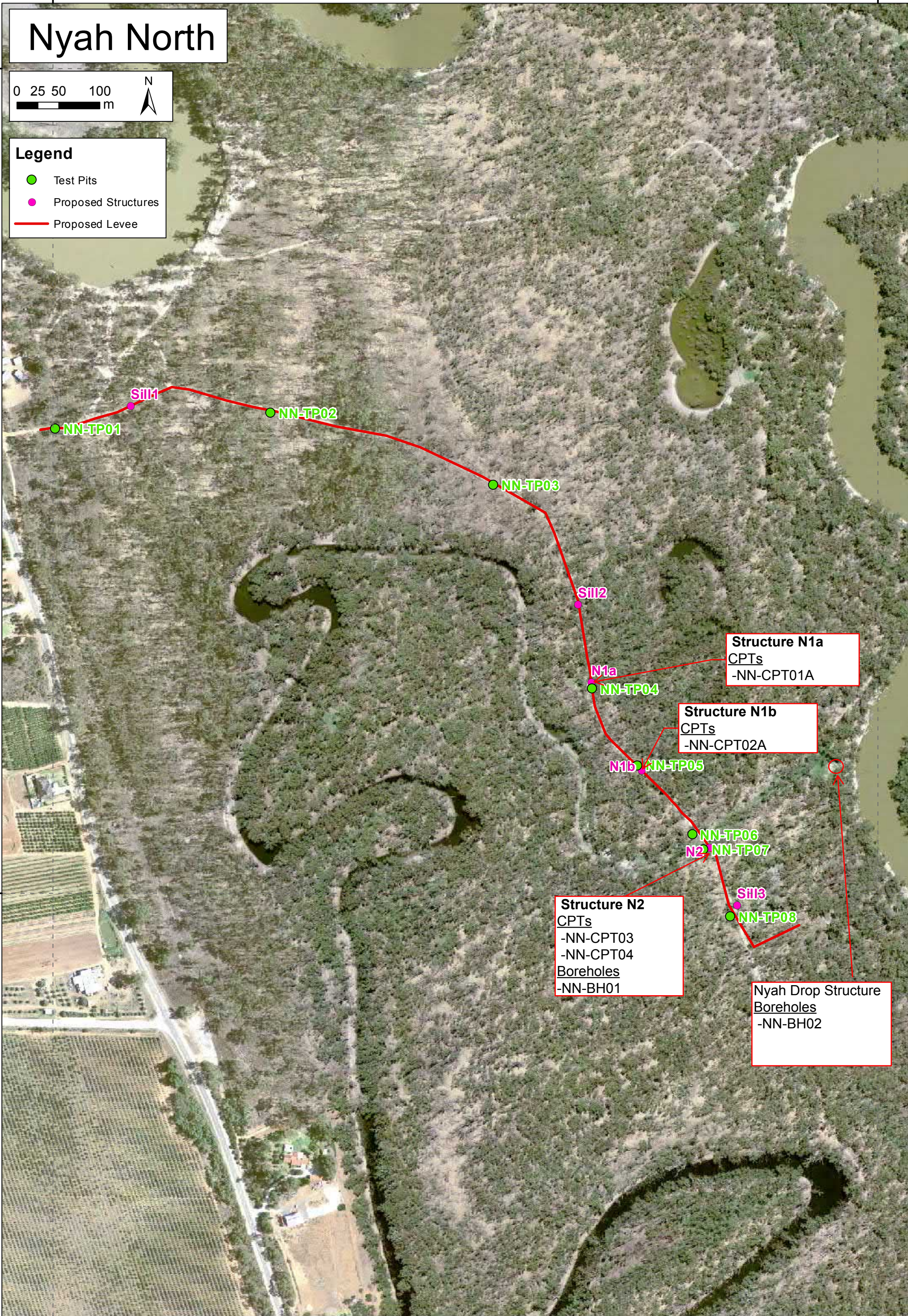
6113000

6112000

6112000

714000

715000





716000

# Nyah Mid

0 25 50 100  
m



## Legend

- Test Pits
- Proposed Structures
- Proposed Levee

6111000

6111000

6110000

6110000

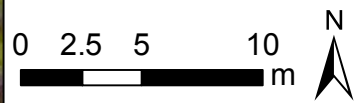
Sill8  
● NN-TP09

716000





# Nyah South



## Legend

- Test Pits
- Proposed Structures
- Proposed Levee

● NS-TP01

● N5

● NS-TP03  
(Spade Sample)

● NS-TP02

### Structure N5

- CPTs
- NS-CPT01
- Boreholes
- NS-BH01

717000

6107000

6107000

717000



717000

# Vinifera North

0 50 100  
m



## Legend

- Test Pits
- Proposed Structures
- Proposed Levee

Vinifera Drop Structure  
Boreholes  
-VN-BH02

6104000

6104000

VN-TP01  
V1

SIII1 VN-TP02

**Structure V1**  
CPTs  
-VN-CPT01  
Boreholes  
-VN-BH01

**Structure V2**  
CPTs  
-VN-CPT02

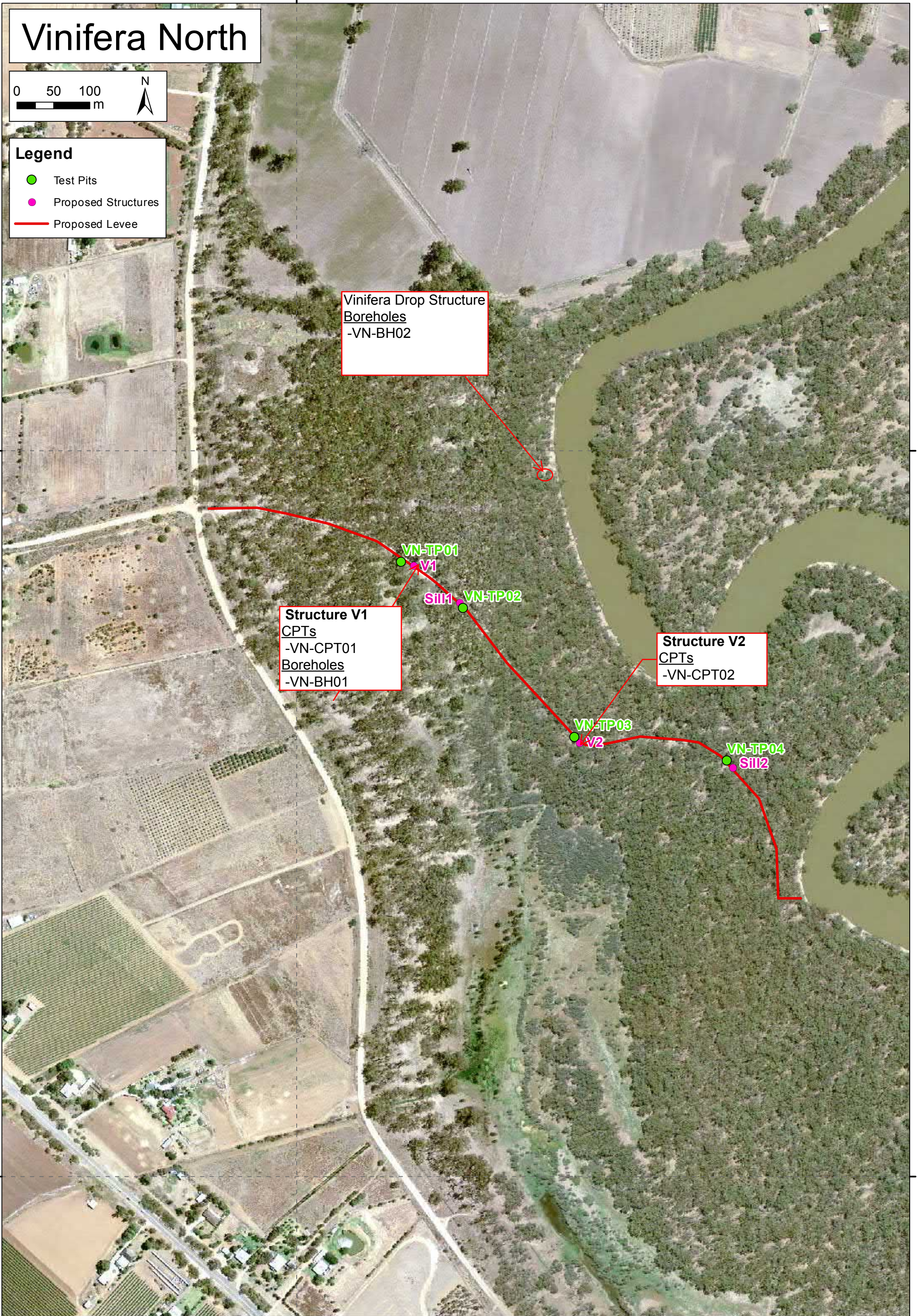
VN-TP03  
V2

VN-TP04  
SIII2

6103000

6103000

717000





720 000

610 3000

# Vinifera South

0 50 100  
m



## Legend

- Test Pits
- Proposed Structures
- Proposed Levee

LP6

VS-TP01 (Spade Sample) VS-TP03 VS-TP02

VS-TP14

LP7

### Structure V4

CPTs  
-VS-CPT04  
Boreholes  
-VS-BH03

VS-TP13

VS-TP12

LP8

VS-TP11

VS-TP10

VS-TP9

VS-TP8

VS-TP7

VS-TP06 VS-TP05 VS-TP04

V3

### Structure V3

CPTs  
-VS-CPT01  
-VS-CPT02  
-VS-CPT03  
Boreholes  
-VS-BH01  
-VS-BH02

610 2000












610 2000

720 000



## Appendix B. Test Pit and Borehole Logs

# SOIL AND ROCK DESCRIPTION ABBREVIATIONS

<u>COLOUR</u>	
	BROWN (br)
	GREY – BROWN (gy/br)
	GREY (gy)
	PURPLE (pr)
	BLUE – GREY (bl/gy)
	BLUE (bl)
	OLIVE (ol)
	BLUE – GREEN (bl/gr)
	GREEN (gr)
	YELLOW (yl)
	YELLOW – BROWN (yl/br)
	ORANGE (or)
	RED (rd)
	RED – BROWN (rd/br)
<b>MODIFIERS</b>	
Light - (lt)	
Dark - (dk)	
Mottled – (mtld)	
And – (&)	
Yellow- brown = yl/br	
Grey and brown = gy & br	

Soil and rock descriptions on the logs are generally in accordance with the recommendations of AS1726. The order in which descriptions are provided on the logs is as follows:

**SOIL:**

SOIL TYPE (Unified Classification), colour, structure, particle characteristics, geological origin, other minor components. The consistency/density and moisture condition are listed as abbreviations in separate columns.

**ROCK:**

ROCK TYPE (Degree of Weathering), colour, grain size, texture and fabric, structure, bedding dip and geological formation. A histogram of rock mass defect spacing and minor defect descriptions are listed under separate columns. Major defects are individually identified in the description column and shown on the graphic log as a single dashed line for defects 10 to 100mm thick and as a seam between 2 dashed lines if > 100mm thick. The material in the seam is fully described.

Field tests are used to assess soil consistency, rock strength and grain size. Unless specifically stated otherwise, these assessments have been transferred directly to the record sheets and not modified. Descriptive terms used on the record sheets are explained on the following pages. Colour should be determined in the "moist" condition using the basic terms provided on the adjacent chart and black (bk) & white (wh). Abbreviations should be used for describing seams.

Other abbreviations used for field tests, consistency, density, strength, moisture condition and contaminant ranking are summarised at the base of the log sheets.

**STRUCTURE**

The structure of soil (or rock) is usually applicable to cohesive soils or rock. Typical terms used are: **intact** (no joints), **fissured** (closed joints), **voided** (confined to open joints), **slickensided** (sheared), **interbedded** (laminated) and **cemented**.

**GEOLOGICAL ORIGIN**

**WEATHERED IN PLACE SOILS**

Extremely weathered material	Structure and fabric of parent rock visible
Residual soil	Structure and fabric of parent rock not visible

**TRANSPORTED SOILS**

Aeolian soil	Deposited by wind.
Alluvial soil	Deposited by streams and rivers.
Colluvial soil	Deposited on slopes (transported downslope)
Lacustrine soil	Deposited by lakes.
Marine soil	Deposited in ocean, bays, beaches and estuaries.

**FILL MATERIALS**

Soil Fill	Describe soil type, UCS symbol and add 'FILL'.
Rock Fill	Rock type, degree of weathering, and word 'FILL'.
Domestic Fill	Percent soil or rock, whether pretrucible or not.
Industrial Fill	Percent soil, whether contaminated, particle size & type of waste product, ie – brick, concrete, metal

**MOISTURE CONDITION**

Term	Symbol	Description		
		Cohesive Soils	Granular Soils	Rock
Dry	D	Cohesive; hard and friable or powdery, dry of Plastic Limit (PL)	Cohesion-less and free running	Dry on broken faces
Moist	M	Soil feels cool, darkened in colour, can be moulded, near PL	Soil feels cool, darkened in colour, tends to cohere	Rock is darkened, moisture on broken faces
Wet	W	Soil feels cool, dark, usually weakened, free water, >> PL	Soil feels cool, darkened in colour, tends to cohere	NA

**SHEET 1  
SOIL AND ROCK DESCRIPTION  
ABBREVIATIONS**



# SOIL AND ROCK DESCRIPTION SOIL CLASSIFICATION

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60mm and basing fractions on estimated mass)				GROUP SYMBOLS	SYMBOL	TYPICAL NAMES	INFORMATION REQUIRED FOR DESCRIBING SOILS	LABORATORY CLASSIFICATION CRITERIA						
COARSE GRAINED SOILS  More than 50% of material less than 63 mm is larger than 0.075 mm	GRAVELS  More than 50% of coarse fraction is larger than 2.36mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	GW		Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name, symbol, indicate approximate % of sand and gravel, max. size, angularity, surface condition, and strength of coarse grains: colour, amount plasticity of fine component.  For undisturbed soils add information on moisture content, degree of compactness, stratification, cementation, odour.  Give local and other pertinent descriptive information.  Example:  SILTY SAND (SM), fine to coarse, light grey, about 20% strong angular gravel particles – 10mm max. size, rounded and sub-angular sand, about 12% non-plastic fines, moist, dense alluvial sand.	Determine percentages of gravel and sand from grain size curve Depending on percentage smaller than 0.06mm size coarse grained soils are classified as follows:  Less than 5% GW, GP, SW, SP More than 12% GM, GC, SM, SC Borderline cases requiring 5% to 12% use of dual symbols	$c_u = \frac{D_{60}}{D_{10}}$ Greater than 4 $c_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 & 3  Not meeting all gradation requirements for GW.  Atterberg limits below 'A' line or $I_p$ less than 4  Atterberg limits above 'A' line with $I_p$ greater than 7.      Above 'A' line with PI between 4 and 7 are borderline cases requiring use of dual symbols.					
			Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	GP		Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels								
		GRAVELS WITH FINES (Appreciable amount of fines)	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	GM		Silty gravels, gravel-sand-silt mixtures								
			'Dirty' materials with excess of plastic fines, medium to high dry strength	GC		Clayey gravels, gravel-sand-clay mixtures								
		SANDS  More than 50% of coarse fraction is smaller than 2.36mm	CLEAN SANDS (little or no fines)	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	SW					Well graded sands, gravelly sands, little or no fines				
				Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	SP					Poorly graded sands and gravelly sands; little or no fines, uniform sands				
	SANDS WITH FINES (Appreciable amount of fines)		'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	SM		Silty sands, sand-silt mixtures								
			'Dirty' materials with excess of plastic fines, medium to high dry strength	SC		Clayey sands, sand-clay mixtures								
	FINE GRAINED SOILS  More than 50% of material less than 63 mm is smaller than 0.075 mm	IDENTIFICATION PROCEDURES ON FRACTIONS < 0.2 mm												
		SILTS AND CLAYS  Liquid limit less than 50	DRY STRENGTH	DILATANCY	TOUGHNESS	ML					Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with low plasticity. Silts of low to medium Liquid Limit.	Give typical name, symbol, indicate degree and character of plasticity, colour, amount and size of coarse grains.  For undisturbed soils add information on moisture content, consistency, structure, stratification, odour.  Give local or geologic name and other pertinent descriptive information.  Example: clayey SILT (ML), slightly plastic, brown, small percentage of sand, firm, dry, numerous vertical root holes.	Use grain size curve in identifying the fractions as given under field identification	Plasticity Chart (for laboratory classification of fine grained soils)  
None to low						Quick to slow	None	CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.				
Medium to high						None to very slow	Medium	OL		Organic silts and organic silt-clays of low to medium plasticity				
SILTS AND CLAYS  Liquid limit greater than 50			DRY STRENGTH	DILATANCY	TOUGHNESS	Low to medium	Slow	Low	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, silts of high Liquid Limit			
						High to very high	None	High	CH		Inorganic clays of high plasticity			
						Medium to high	None to very slow	Low to medium	OH		Organic clays of high plasticity			
HIGHLY ORGANIC SOILS			Readily identified by colour, odour, spongy feel and frequently by fibrous texture	Pt		Peat and other highly organic soils								

Boundary classifications – Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.

# SOIL AND ROCK DESCRIPTION

## SOIL DESCRIPTION













### SOIL TYPE

Classification of soils for engineering purposes is based on the *Unified Classification System* which uses 75 microns as the division of fine grained and coarse grained soils.

The soil type is based on the particle size less than 63 mm diameter and the plasticity of the material passing the 425 mm sieve. If more than 50% of the material passes the 75 mm sieve it is a fine grained soil (CLAY or SILT). The predominant particle size is noted as the primary soil type and this may be modified by the coarse grained portion if it is greater than 30% of the total dry mass, ie SANDY CLAY. If there is less than 30% coarse grained material but more than 12% of the secondary particle size then the modifier is fine grained, ie SILTY CLAY. In the case of where there are less than 50% fines but more than 12% fines then the predominant coarse grained fraction (sand or gravel) is modified by the predominant fine grained soil type, ie SILTY GRAVEL. **Do not use** multiple soil type descriptions such as SILTY CLAYEY GRAVEL, make a decision on the predominant minor constituents or its engineering characteristics, ie. plastic then it is a clay. Where mixtures of soil occur, the secondary components should be described as per a primary material.

### GRAIN SIZE

Soil Type (Abbrev.)	CLAY (CL)	SILT (SI)	SAND (SA)			GRAVEL (GR)			COBBLES (CO)
	< 2 mm	2 – 75 mm	Fine (f) 0.075-0.2 mm	Medium (m) 0.2-0.6 mm	Coarse (c) 0.6-2.36 mm	Fine (f) 2.36-6 mm	Medium (m) 6-20 mm	Coarse (c) 20-63 mm	
Shape & Texture	Shiny	Dull	very angular / angular / subangular / subrounded / rounded / well rounded (low/high sphericity)						
Field Guide	Not visible under 10x	Visible under 10x	Visible by eye	Visible at < 1 m	Visible at < 3 m	Visible at < 5 m	Road gravel	Rail ballast	Beaching

	Very Angular	Angular	Subangular	Subrounded	Rounded	Well Rounded
High Sphericity						
Low Sphericity						

**DENSITY** (non-cohesive soils) based on range of SPT blowcounts for fine to medium sands

Term	Very Loose	Loose	Medium Dense	Dense	Very Dense	Compact
Symbol	VL	L	MD	D	VD	CO
SPT (N) Blowcount	0 - 4	4 - 10	10 - 30	30 - 50	50 - 100	> 50/150 mm
Density Index (%)	< 15	15 - 35	35 - 65	65 - 85	85 - 95	> 95
Field Guide	Ravels	Shovels easily	Shovelling very difficult	Pick required	Pick difficult	Cannot be picked

**CONSISTENCY** (cohesive soils) based on undrained strength ( $S_u$ ) (estimated in field from pocket penetrometer or shear vane)

Term	Very Soft	Soft	Firm	Stiff	Very Stiff	Hard
Symbol	VS	S	F	St	VSt	H
Undrained Shear Strength (kPa)	< 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
SPT (N) Blowcount	0 - 2	2 - 4	4 - 8	8 - 15	15 - 30	> 30
Field Guide	Exudes between the fingers when squeezed	Can be moulded by light finger pressure	Can be moulded by strong finger pressure	Cannot be moulded by fingers. Can be indented by thumb nail	Can be indented by thumb nail	Can be indented with difficulty with thumb nail

### MINOR COMPONENTS

Term	Trace of	With some
% Minor Component	Coarse grained soils: < 5% Fine grained soils: <12%	Coarse grained soils: 5 – 12% Fine grained soils: 12 – 30%
Field Guide	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary components	Presence easily detectable by feel or eye, soil properties little different to general properties of primary component

### ORGANICS



















Organic matter (non-waste fill) should be described as fibrous peat, charcoal, wood fragments, roots (>2mm diam.) or root fibres (<2mm diam.)

# SOIL AND ROCK DESCRIPTION
















## ROCK DESCRIPTION

### GRAPHIC SYMBOLS

#### SEDIMENTARY

CLASTIC	NON-CLASTIC (Chemical)	NON-CLASTIC (Organic)
 Conglomerate	 Limestone	 Coal
 Breccia	 Dolomite	 Calcarenite
 Sandstone	 Chert	 Coral
 Siltstone	 Gypsum	 Inferior Coal (>10% ash)
 Claystone	 Marl	 Limestone
 Shale	 Chalk	 Peat

#### IGNEOUS & METAMORPHIC

	ACID	INTERMEDIATE	BASIC
IGNEOUS EXTRUSIVE	 Rhyolite	 Andesite	 Basalt (newer)
IGNEOUS INTRUSIVE (fine - med. grained)	 Quartz Porphyry	 Porphyry	 Dolerite
(coarse grained)	 Granite / Granodiorite	 Diorite	 Gabbro
MASSIVE METAMORPHIC	 Hornfels	 Quartzite	 Marble
FOLIATED METAMORPHIC	 Slate / Phyllite	 Schist	 Gneiss

### STRENGTH

TERM	EXTREMELY LOW	VERY LOW	LOW	MEDIUM	HIGH	VERY HIGH	EXTREMELY HIGH
SYMBOL	EL	VL	L	M	H	VH	EH
UCS	0.25 – 1MPa	1 – 5 MPa	5 – 25 MPa	25 – 50 MPa	50 – 100 MPa	100 – 250MPa	>250 MPa
FIELD GUIDE	INDENTED BY THUMB NAIL	EXCAVATED WITH SHARP END OF GEOLOGY PICK.	SHALLOW INDENTATION MADE BY FIRM BLOWS WITH SHARP END OF GEOLOGY PICK	SPECIMEN CAN FRACTURE WITH A SINGLE BLOW OF GEOLOGY HAMMER	SPECIMEN REQUIRES MORE THAN ONE BLOW OF A GEOLOGY HAMMER TO FRACTURE	SPECIMEN REQUIRES MANY BLOWS OF A GEOLOGICAL HAMMER TO FRACTURE IT.	SPECIMEN CAN ONLY BE CHIPPED WITH A GEOLOGICAL HAMMER. SAMPLE WILL RING WHEN HIT.

PROJECT : Mallee CMA - SDL Adjustment Project	JOB NO : IS079600	PAGE : 1 OF 1
POSITION : E: 712145, N: 6131922 (MGA94)	SURFACE ELEVATION : 59.000 (AHD)	LOCATION : Structure B2
RIG TYPE : 4WD Mounted	CONTRACTOR : Civitest Pty Ltd	DIP / AZIMUTH : 90°
DATE DRILLED : 31/10/14 to 31/10/14	LOGGED BY : JL	CHECKED BY : CJ
		STANDARD : AS1726-1993

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY		COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits						D	H	
AD Not Encountered					U 0.25m			FILL: Silty CLAY: (CH) grey				
						58.0	1.0	Silty CLAY: (CI) brown, trace sand		VSt		
						57.0	2.0	grey mottled brown-orange		M		
						56.0	3.0					
						55.0	4.0					
						54.0	5.0					
						53.0	6.0					
						52.0	7.0		with fine sand		St to VSt	
					51.0	8.0		Borehole terminated at 8.0m (Target Depth)				
						50.0	9.0					

<b>DRILLING</b> HA Hand Auger    HQ HQ Coring SFA Solid Flight Auger    NQ NQ Coring WB Washbore    PQ PQ Coring RR Rock Rolling    NMLC NMLC Coring AH Air Hammer	<b>SAMPLES &amp; FIELD TESTS</b> D Disturbed Sample    SPT SPT Sample B Bulk Sample    U Undisturbed Tube Sample ES Env Soil Sample    W Water Sample EW Env Water Sample PP Hand Penetrometer SV Hand Vane Shear    MOISTURE CONDITION (P: Peak Su R: Residual Su)    D = Dry    M = Moist    W = Wet N SPT blows per 300mm HW SPT penetration by hammer weight RW SPT penetration by rod weight	<b>DENSITY (N-value)</b> VL Very Loose    0 - 4 L Loose    4 - 10 MD Medium Dense    10 - 30 D Dense    30 - 50 VD Very Dense    50 - 100	<b>CONSISTENCY (Su) {N-value}</b> VS Very Soft    < 12 kPa {0-2} S Soft    12 - 25 {2-4} F Firm    25 - 50 {4-8} St Stiff    50 - 100 {8-15} VSt Very Stiff    100 - 200 {15-30} H Hard    > 200 kPa {>30}
<b>GROUNDWATER SYMBOLS</b> ▼ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow			

JACOBS AGS REV04 (WORKING) GLB Log SKM SOIL LOG - BOREHOLE LOGS.GPJ <-DrawingFile> 10/12/2014 16:03

PROJECT : Mallee CMA - SDL Adjustment Project	JOB NO : IS079600	PAGE : 1 OF 1
POSITION : E: 712131, N: 6131925 (MGA94)	SURFACE ELEVATION : 58.600 (AHD)	LOCATION : Structure B2
RIG TYPE : 4WD Mounted	CONTRACTOR : Civitest Pty Ltd	DIP / AZIMUTH : 90°
DATE DRILLED : 31/10/14 to 31/10/14	LOGGED BY : JL	CHECKED BY : CJ
STANDARD : AS1726-1993		

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations			
	Moisture Content	Dry Density	% Fines	Atterberg Limits										
AD 31/10/14 - 0000 30/10/14 - 0000 31/10/14 - 0000	19.2	94	LL=62 Pl=43 LS=18	U	57.6	0.90m	[Cross-hatched]	FILL: Silty CLAY: (CI) brown, grey, trace fine sand	D	VSt				
				D	56.6	2.00m	[Diagonal lines]	Silty CLAY: (CH) dark grey, mottled brown	M	VSt to H				
				D	55.6	2.50m	[Diagonal lines]	dark grey, brown			1.50: Pocket penetrometer unable to penetrate soil			
				D	54.6	4.0	[Diagonal lines]	brown, trace sand						
				D	53.6	5.0	[Diagonal lines]	brown, grey						
				D	52.6	6.0	[Diagonal lines]	trace fine sand						
				D	51.6	7.0	[Diagonal lines]	brown, with fine sand						
				D	50.6	8.0	[Diagonal lines]	Sandy CLAY: (SC) grey-blue, mottled brown						
											Borehole terminated at 8.0m (Target Depth)			
									49.6	9.0				

<b>DRILLING</b> HA Hand Auger SFA Solid Flight Auger WB Washbore RR Rock Rolling AH Air Hammer HQ HQ Coring NQ NQ Coring PQ PQ Coring NMLC NMLC Coring	<b>SAMPLES &amp; FIELD TESTS</b> D Disturbed Sample B Bulk Sample ES Env Soil Sample EW Env Water Sample PP Hand Penetrometer SV Hand Vane Shear N SPT blows per 300mm HW SPT penetration by hammer weight RW SPT penetration by rod weight SPT SPT Sample U Undisturbed Tube Sample W Water Sample MOISTURE CONDITION D = Dry M = Moist W = Wet	<b>DENSITY (N-value)</b> VL Very Loose 0 - 4 L Loose 4 - 10 MD Medium Dense 10 - 30 D Dense 30 - 50 VD Very Dense 50 - 100	<b>CONSISTENCY (Su) {N-value}</b> VS Very Soft < 12 kPa {0-2} S Soft 12 - 25 {2-4} F Firm 25 - 50 {4-8} St Stiff 50 - 100 {8-15} VSt Very Stiff 100 - 200 {15-30} H Hard > 200 kPa {>30}
<b>GROUNDWATER SYMBOLS</b> ▽ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow			

JACOBS AGS REV04 (WORKING) G.L.B. Log SKM SOIL LOG - BOREHOLE LOGS.GPJ <-DrawingFiles> 10/12/2014 16:07

PROJECT : Mallee CMA - SDL Adjustment Project JOB NO : IS079600	PAGE : 1 OF 2
POSITION : E: 711722, N: 6136843 (MGA94) SURFACE ELEVATION : 56.600 (AHD)	LOCATION : Structure B1
RIG TYPE : 4WD Mounted CONTRACTOR : Civitest Pty Ltd	DIP / AZIMUTH : 90°
DATE DRILLED : 31/10/14 to 31/10/14 LOGGED BY : JL CHECKED BY : CJ	STANDARD : AS1726-1993

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY		COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits						D	H	
AD 31/10/14 - 0000	13	62	LL=36 PI=22 LS=11	U	1.30m	55.6 - 1.0	FILL: Silty CLAY: (CI) brown, with fine sand	D	H	1.65: Pocket penetrometer unable to penetrate soil		
					1.65m	54.6 - 2.0	Silty CLAY: (CH) brown, trace fine sand	M	VSt to H			
							grey, mottled brown					
					2.10m D	53.6 - 3.0	Sandy CLAY: (CI) grey, fine sand					
4.90m D	51.6 - 5.0	Silty CLAY: (CL) brown, trace sand		St to VSt								
6.50m D	49.6 - 7.0	69	LL=33 PI=19 LS=9	U	6.40m	48.6 - 6.0	Clayey SAND: (SC) yellow, grey, fine grained	W	MD			
					9.20m	47.6 - 9.0	Silty CLAY: (CL) brown, trace sand					
							Sandy CLAY: (CI) blue grey, fine sand	M	VSt			
	10.00m											

<b>DRILLING</b> HA Hand Auger HQ HQ Coring SFA Solid Flight Auger NQ NQ Coring WB Washbore PQ PQ Coring RR Rock Rolling NMLC NMLC Coring AH Air Hammer	<b>SAMPLES &amp; FIELD TESTS</b> D Disturbed Sample SPT SPT Sample B Bulk Sample U Undisturbed Tube Sample ES Env Soil Sample W Water Sample EW Env Water Sample PP Hand Penetrometer SV Hand Vane Shear (P: Peak Su R: Residual Su) N SPT blows per 300mm HW SPT penetration by hammer weight RW SPT penetration by rod weight	<b>DENSITY (N-value)</b> VL Very Loose 0 - 4 L Loose 4 - 10 MD Medium Dense 10 - 30 D Dense 30 - 50 VD Very Dense 50 - 100	<b>CONSISTENCY (Su) {N-value}</b> VS Very Soft < 12 kPa {0-2} S Soft 12 - 25 {2-4} F Firm 25 - 50 {4-8} St Stiff 50 - 100 {8-15} VSt Very Stiff 100 - 200 {15-30} H Hard > 200 kPa {>30}
<b>GROUNDWATER SYMBOLS</b> ▽ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow	<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet		

JACOBS AGS REV04 (WORKING) G.L.B. Log SKM SOIL LOG - BOREHOLE LOGS.GPJ <-DrawingFiles> 10/12/2014 16:03

PROJECT : Mallee CMA - SDL Adjustment Project JOB NO : IS079600 PAGE : 2 OF 2  
 POSITION : E: 711722, N: 6136843 (MGA94) SURFACE ELEVATION : 56.600 (AHD) LOCATION : Structure B1  
 RIG TYPE : 4WD Mounted CONTRACTOR : Civitest Pty Ltd DIP / AZIMUTH : 90°  
 DATE DRILLED : 31/10/14 to 31/10/14 LOGGED BY : JL CHECKED BY : CJ STANDARD : AS1726-1993

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits							
						45.6 - 11.0			Borehole terminated at 10.0m (Target Depth)		
						44.6 - 12.0					
						43.6 - 13.0					
						42.6 - 14.0					
						41.6 - 15.0					
						40.6 - 16.0					
						39.6 - 17.0					
						38.6 - 18.0					
						37.6 - 19.0					

<p><b>DRILLING</b></p> <p>HA Hand Auger HQ HQ Coring                  SFA Solid Flight Auger NQ NQ Coring                  WB Washbore PQ PQ Coring                  RR Rock Rolling NMLC NMLC Coring                  AH Air Hammer</p> <p><b>GROUNDWATER SYMBOLS</b></p> <p>▼ = Water level (static)                  ▽ = Water level (during drilling)                  ► = Water inflow                  ◄ = Water outflow</p>	<p><b>SAMPLES &amp; FIELD TESTS</b></p> <p>D Disturbed Sample SPT SPT Sample                  B Bulk Sample U Undisturbed Tube Sample                  ES Env Soil Sample W Water Sample                  EW Env Water Sample</p> <p>PP Hand Penetrometer                  SV Hand Vane Shear                  N SPT blows per 300mm                  HW SPT penetration by hammer weight                  RW SPT penetration by rod weight</p> <p><b>MOISTURE CONDITION</b>                  D = Dry M = Moist W = Wet</p>	<p><b>DENSITY (N-value)</b></p> <p>VL Very Loose 0 - 4                  L Loose 4 - 10                  MD Medium Dense 10 - 30                  D Dense 30 - 50                  VD Very Dense 50 - 100</p>	<p><b>CONSISTENCY (Su) {N-value}</b></p> <p>VS Very Soft &lt; 12 kPa {0-2}                  S Soft 12 - 25 {2-4}                  F Firm 25 - 50 {4-8}                  St Stiff 50 - 100 {8-15}                  VSt Very Stiff 100 - 200 {15-30}                  H Hard &gt; 200 kPa {&gt;30}</p>
--	---	--	--

JACOBS AGS REV04 (WORKING) GJB Log SKM SOIL LOG - BOREHOLE LOGS.GPJ <-DrawingFile>> 10/12/2014 16:03

PROJECT : Mallee CMA - SDL Adjustment Project	JOB NO : IS079600	PAGE : 1 OF 2
POSITION : E: 711728, N: 6136836 (MGA94)	SURFACE ELEVATION : 56.800 (AHD)	LOCATION : Structure B1
RIG TYPE : 4WD Mounted	CONTRACTOR : Civitest Pty Ltd	DIP / AZIMUTH : 90°
DATE DRILLED : 31/10/14 to 31/10/14	LOGGED BY : JL	CHECKED BY : CJ
		STANDARD : AS1726-1993

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations		
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
AD 30/10/14 - 0000 	11.8	89	LL=41 Pl=26 LS=11.5	0.70m	U	55.8	1.0	0.30m FILL: Silty CLAY: (CI) brown, with fine sand Silty CLAY: (CI) grey brown	D	VSt	1.10: Pocket penetrometer unable to penetrate soil		
				1.10m		54.8	2.0						
				3.30m	D	53.8	3.0	2.70m	M	Sandy CLAY: (CI) grey mottled, fine sand			
				5.00m	D	52.8	4.0	4.50m	D	Clayey SAND: (SC) grey, fine grained			
				8.00m	D	51.8	5.0			yellow brown			W
						50.8	6.0						
						49.8	7.0						
						48.8	8.0						
						47.8	9.0						
						9.80m	10.00m		M	Sandy CLAY: (CI)			St to VSt

<b>DRILLING</b> HA Hand Auger SFA Solid Flight Auger WB Washbore RR Rock Rolling AH Air Hammer HQ HQ Coring NQ NQ Coring PQ PQ Coring NMLC NMLC Coring	<b>SAMPLES &amp; FIELD TESTS</b> D Disturbed Sample B Bulk Sample ES Env Soil Sample EW Env Water Sample PP Hand Penetrometer SV Hand Vane Shear N SPT blows per 300mm HW SPT penetration by hammer weight RW SPT penetration by rod weight SPT SPT Sample U Undisturbed Tube Sample W Water Sample MOISTURE CONDITION D = Dry M = Moist W = Wet	<b>DENSITY (N-value)</b> VL Very Loose 0 - 4 L Loose 4 - 10 MD Medium Dense 10 - 30 D Dense 30 - 50 VD Very Dense 50 - 100	<b>CONSISTENCY (Su) {N-value}</b> VS Very Soft < 12 kPa {0-2} S Soft 12 - 25 {2-4} F Firm 25 - 50 {4-8} St Stiff 50 - 100 {8-15} VSt Very Stiff 100 - 200 {15-30} H Hard > 200 kPa {>30}
<b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow			

JACOBS AGS REV04 (WORKING) G.L.B. Log SKM SOIL LOG - BOREHOLE LOGS.GPJ <-DrawingFiles> 10/12/2014 16:03



PROJECT : Mallee CMA - SDL Adjustment Project	JOB NO : IS079600	PAGE : 2 OF 2
POSITION : E: 711728, N: 6136836 (MGA94)	SURFACE ELEVATION : 56.800 (AHD)	LOCATION : Structure B1
RIG TYPE : 4WD Mounted	CONTRACTOR : Civitest Pty Ltd	DIP / AZIMUTH : 90°
DATE DRILLED : 31/10/14 to 31/10/14	LOGGED BY : JL	CHECKED BY : CJ
		STANDARD : AS1726-1993

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits							
						45.8 - 11.0			blue grey, fine sand Borehole terminated at 10.0m (Target Depth)		
						44.8 - 12.0					
						43.8 - 13.0					
						42.8 - 14.0					
						41.8 - 15.0					
						40.8 - 16.0					
						39.8 - 17.0					
						38.8 - 18.0					
						37.8 - 19.0					

<b>DRILLING</b> HA Hand Auger HQ HQ Coring SFA Solid Flight Auger NQ NQ Coring WB Washbore PQ PQ Coring RR Rock Rolling NMLC NMLC Coring AH Air Hammer	<b>SAMPLES &amp; FIELD TESTS</b> D Disturbed Sample SPT SPT Sample B Bulk Sample U Undisturbed Tube Sample ES Env Soil Sample W Water Sample EW Env Water Sample PP Hand Penetrometer SV Hand Vane Shear (P: Peak Su R: Residual Su) N SPT blows per 300mm HW SPT penetration by hammer weight RW SPT penetration by rod weight	<b>DENSITY (N-value)</b> VL Very Loose 0 - 4 L Loose 4 - 10 MD Medium Dense 10 - 30 D Dense 30 - 50 VD Very Dense 50 - 100	<b>CONSISTENCY (Su) {N-value}</b> VS Very Soft < 12 kPa {0-2} S Soft 12 - 25 {2-4} F Firm 25 - 50 {4-8} St Stiff 50 - 100 {8-15} VSt Very Stiff 100 - 200 {15-30} H Hard > 200 kPa {>30}
<b>GROUNDWATER SYMBOLS</b> ▼ = Water level (static) ▽ = Water level (during drilling) ► = Water inflow ◄ = Water outflow	<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet		

JACOBS AGS REV04 (WORKING) G.L.B. Log SKM SOIL LOG - BOREHOLE LOGS.GPJ <-DrawingFile>> 10/12/2014 16:03

PROJECT : Nyah Burra Vinifera	JOB NO : IS135300	PAGE : 1 OF 1
POSITION : E: 711727, N: 6136848 (54 MGA94)	SURFACE ELEVATION : 56.200 (AHD)	LOCATION : Burra B1 Structure
RIG TYPE : Drill Rig	CONTRACTOR : Civil Test	DIP / AZIMUTH : 90°
DATE DRILLED : 6/20/16 to 6/20/16	LOGGED BY : MS	CHECKED BY : DG
		STANDARD : AS1726

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY		COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits								
SFA 20/06/16 - 0000	19	82	LL=51 Pl=38	1.00m	55.2	1.0		Silty CLAY (CH): High plasticity, grey, mottled black, orange, with some fine grained sand	M	St	1.00: SPT Recovery: 0.45 m	
				SPT 4, 5, 6 N=11								
				1.45m								
				1.95m								
				3.00m	53.2	3.0		Sandy SILT (ML): Low plasticity, yellow, grey, fine grained sand.	D	MD	3.00: SPT Recovery: 0.45 m	
SPT 10, 11, 9 N=20												
				4.50m	51.2	5.0		Silty SAND / sandy SILT (SM): Fine to medium grained, orange, low plasticity fines.	W		6.00: Laboratory grading shows a high fines content, predominantly SILT. Observations on-site during drilling, showed material to have silty sand content.; SPT Recovery: 0.45 m	
SPT 1, 4, 11 N=15												
				6.00m	50.2	6.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				4.95m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.00m	50.2	6.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0		SAND with clay (SW): Fine to medium grained, yellow, orange	W		4.50: SPT Recovery: 0.45 m	
SPT 1, 6, 9 N=15												
				6.45m	51.2	5.0						

**BCN-BH03- (Burra B1 Structure):**



Borehole Setup



SPT Depth 1.0-1.45m



SPT Depth 3.0-3.45m



SPT Depth 3.0-3.45m, close up view

**BCN-BH03- (Burra B1 Structure):**



SPT Depth 4.5-4.95m



SPT Depth 4.5-4.95m, close up view



SPT Depth 6.0-6.45m



SPT Depth 6.0-6.45m, close up view



PROJECT : Nyah Burra Vinifera	JOB NO : IS135300	PAGE : 1 OF 1
POSITION : E: 712115, N: 6136778 (54 MGA94)	SURFACE ELEVATION : 56.000 (AHD)	LOCATION : Burra Drop Structure
RIG TYPE : Drill Rig	CONTRACTOR : Civil Test	DIP / AZIMUTH : 90°
DATE DRILLED : 6/21/16 to 6/21/16	LOGGED BY : MS	CHECKED BY : DG
		STANDARD : AS1726

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits							
SFA 21/06/16 - 0000					1.00m SPT 5, 5, 6 N=11	55.0	1.0	Sandy CLAY (CL): Low plasticity, light brown mottled orange, red, grey, fine to medium grained sand	D St	1.00: SPT Recovery: 0.45 m	
					1.45m						D to M
					3.00m SPT 4, 5, 7 N=12	54.0	2.0	Silty CLAY (CI): Intermediate plasticity, brown, orange, grey, with some fine to medium grained sand	D	3.00: SPT Recovery: 0.45 m	
					3.45m		with some wood bits becoming grey, blue, mottled orange	M			
				4.50m SPT 3, 6, 4 N=10	53.0	3.0	SAND with clay (SW): Fine to medium grained, pale yellow	MD S to F	4.50: SPT Recovery: 0.45 m		
				4.95m		Silty CLAY (CI): Intermediate plasticity, grey, blue mottled orange, with some fine grained sand	W				
				6.00m SPT 1, 2, 3 N=5	51.0	5.0	SAND with clay (SW): Fine to coarse grained, grey, white	L	6.00: SPT Recovery: 0.45 m		
					6.45m	6.45m	Borehole terminated at target depth. Borehole backfilled with drill cuttings. Ground water encountered at 5.6m depth during drilling.				

<b>DRILLING</b> HA Hand Auger HQ HQ Coring SFA Solid Flight Auger NQ NQ Coring WB Washbore PQ PQ Coring RR Rock Rolling NMLC NMLC Coring AH Air Hammer	<b>SAMPLES &amp; FIELD TESTS</b> D Disturbed Sample SPT SPT Sample B Bulk Sample U Undisturbed Tube Sample ES Env Soil Sample W Water Sample EW Env Water Sample PP Hand Penetrometer SV Hand Vane Shear (P: Peak Su R: Residual Su) N SPT blows per 300mm HW SPT penetration by hammer weight RW SPT penetration by rod weight	<b>DENSITY (N-value)</b> VL Very Loose 0 - 4 L Loose 4 - 10 MD Medium Dense 10 - 30 D Dense 30 - 50 VD Very Dense 50 - 100	<b>CONSISTENCY (Su) {N-value}</b> VS Very Soft < 12 kPa {0-2} S Soft 12 - 25 {2-4} F Firm 25 - 50 {4-8} St Stiff 50 - 100 {8-15} VSt Very Stiff 100 - 200 {15-30} H Hard > 200 kPa {>30}
<b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow	<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet		

JACOBS AGS REV04 (WORKING) G.L.B. Log SKM SOIL LOG NYAH BURRA VINIFERA GEOTECH JULY 2016.GPJ <<DrawingFiles>> 23/08/2016 15:21

**BCN-BH04- (Burra Drop Structure):**



Borehole Setup



SPT Depth 1.0-1.45m



SPT Depth 1.0-1.45m, close up view

**BCN-BH04- (Burra Drop Structure):**



SPT Depth 3.0-3.45m



SPT Depth 3.0-3.45m, close up view



SPT Depth 4.5-4.95m



SPT Depth 6.0-6.45m



SPT Depth 6.0-6.45m, close up view

PROJECT : Mallee CMA - SDL Adjustment Project	JOB NO : IS079600	PAGE : 1 OF 1
POSITION : E: 712751, N: 6121986 (MGA94)	SURFACE ELEVATION : 61.900 (AHD)	LOCATION : Structure B4
RIG TYPE : 4WD Mounted	CONTRACTOR : Civitest Pty Ltd	DIP / AZIMUTH : 90°
DATE DRILLED : 30/10/14 to 30/10/14	LOGGED BY : JL	CHECKED BY : CJ
		STANDARD : AS1726-1993

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits							
AD Not Encountered	15.5	76	LL=37 PI=23 LS=9.5	0.00m - 0.30m	60.9	0.30m	FILL: Clayey SILT: (ML) brown, with fine sand	D	VSt		
				0.30m - 1.00m	60.9	1.00m	Silty CLAY: (CI) grey-brown, trace fine sand				
				1.00m - 1.45m	59.9	1.45m	Silty CLAY: (CI) grey-brown	M	VSt to H		
				1.45m - 1.95m	59.9	1.95m				1.95: Pocket penetrometer unable to penetrate soil	
				1.95m - 4.40m	58.9	4.40m					
				4.40m - 56.9m	58.9	56.9m					
				56.9m - 6.00m	56.9	6.00m	grey mottled brown, with fine sand	VSt		6.20: PP result = 4.9 kg/cm <sup>2</sup> VS peak = 168kPa VS residual = 67kPa	
				6.00m - 6.20m	55.9	6.20m					
				6.20m - 7.10m	54.9	7.10m	Sandy CLAY: (CI) brown, fine sand, with fine gravel grey				
				7.10m - 7.70m	53.9	7.70m					
7.70m - 8.00m	53.9	8.00m	Borehole terminated at 8.0m (Target Depth)								
8.00m - 9.0m	52.9	9.0m									

<b>DRILLING</b> HA Hand Auger    HQ HQ Coring SFA Solid Flight Auger    NQ NQ Coring WB Washbore    PQ PQ Coring RR Rock Rolling    NMLC NMLC Coring AH Air Hammer	<b>SAMPLES &amp; FIELD TESTS</b> D Disturbed Sample    SPT SPT Sample B Bulk Sample    U Undisturbed Tube Sample ES Env Soil Sample    W Water Sample EW Env Water Sample PP Hand Penetrometer SV Hand Vane Shear    MOISTURE CONDITION (P: Peak Su R: Residual Su)    D = Dry    M = Moist    W = Wet N SPT blows per 300mm HW SPT penetration by hammer weight RW SPT penetration by rod weight	<b>DENSITY (N-value)</b> VL Very Loose    0 - 4 L Loose    4 - 10 MD Medium Dense    10 - 30 D Dense    30 - 50 VD Very Dense    50 - 100	<b>CONSISTENCY (Su) {N-value}</b> VS Very Soft    < 12 kPa {0-2} S Soft    12 - 25 {2-4} F Firm    25 - 50 {4-8} St Stiff    50 - 100 {8-15} VSt Very Stiff    100 - 200 {15-30} H Hard    > 200 kPa {>30}
<b>GROUNDWATER SYMBOLS</b> ▽ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow			

JACOBS AGS REV04 (WORKING) G.L.B. Log SKM SOIL LOG - BOREHOLE LOGS.GPJ <-DrawingFiles> 10/12/2014 16:04



PROJECT : Mallee CMA - SDL Adjustment Project JOB NO : IS079600	PAGE : 1 OF 1
POSITION : E: 714789, N: 6112069 (MGA94) SURFACE ELEVATION : 62.100 (AHD)	LOCATION : Structure N2
RIG TYPE : 4WD Mounted CONTRACTOR : Civitest Pty Ltd	DIP / AZIMUTH : 90°
DATE DRILLED : 29/10/14 to 29/10/14 LOGGED BY : JL CHECKED BY : CJ	STANDARD : AS1726-1993

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY		COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits								
AD Not Encountered	23.4	98	LL=50 Pl=31 LS=14	U	0.50m D	61.1	0.30m	FILL: Silty CLAY: (CI) brown, trace fine sand and gravel	D	St		
					2.15m D	60.1		Silty CLAY: (CI) dark brown, mottled orange	M	VSt		
					2.50m D	59.1	1.50m	Silty CLAY: (CH) grey-brown, mottled orange			2.15: PP result = 3.3kg/cm <sup>2</sup> VS peak = 159kPa VS residual = 32kPa	
					3.60m D	58.1		brown				
					4.30m U	57.1	4.30m	CLAY: (CL) grey, mottled orange-brown, trace fine to coarse sand	W	St	4.70: PP result = 3.4kg/cm <sup>2</sup>	
					4.70m	56.1			M	VSt to H		
					5.50m D	55.1	7.00m	Clayey SAND: (SC) brown-orange		D		
					7.10m D	54.1	7.70m	Silty CLAY: (CI) brown-orange, with fine sand		VSt to H		
					7.80m D	53.1	8.00m	Borehole terminated at 8.0m (Target Depth)				

DRILLING	SAMPLES & FIELD TESTS	DENSITY (N-value)	CONSISTENCY (Su) {N-value}
HA Hand Auger	D Disturbed Sample	VL Very Loose 0 - 4	VS Very Soft < 12 kPa {0-2}
SFA Solid Flight Auger	B Bulk Sample	L Loose 4 - 10	S Soft 12 - 25 {2-4}
WB Washbore	ES Env Soil Sample	MD Medium Dense 10 - 30	F Firm 25 - 50 {4-8}
RR Rock Rolling	EW Env Water Sample	D Dense 30 - 50	St Stiff 50 - 100 {8-15}
AH Air Hammer	PP Hand Penetrometer	VD Very Dense 50 - 100	VSt Very Stiff 100 - 200 {15-30}
	SV Hand Vane Shear		H Hard > 200 kPa {>30}
	(P: Peak Su R: Residual Su)		
	N SPT blows per 300mm		
	HW SPT penetration by hammer weight		
	RW SPT penetration by rod weight		

JACOBS AGS REV04 (WORKING) GLB Log SKM SOIL LOG - BOREHOLE LOGS.GPJ <-DrawingFiles> 10/12/2014 16:04



**NN-BH02- (Nyah Drop Structure):**



Borehole Setup



STP Depth 1.0-1.45m



STP Depth 2.0-2.45m



STP Depth 3.0-3.45m

**NN-BH02- (Nyah Drop Structure):**



STP Depth 4.0-4.45m



STP Depth 5.0-5.45m



Depth 5.0-5.4, close up



Depth 5.4, close up



**NN-BH02- (Nyah Drop Structure):**



STP Depth 5.5-5.95m



STP Depth 5.5-5.95m, close up view

PROJECT : Mallee CMA - SDL Adjustment Project JOB NO : IS079600 PAGE : 1 OF 1  
 POSITION : E: 716984, N: 6107058 (MGA94) SURFACE ELEVATION : 63.800 (AHD) LOCATION : Structure N5  
 RIG TYPE : 4WD Mounted CONTRACTOR : Civitest Pty Ltd DIP / AZIMUTH : 90°  
 DATE DRILLED : 29/10/14 to 29/10/14 LOGGED BY : JL CHECKED BY : CJ STANDARD : AS1726-1993

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits							
Not Encountered	8.4	70	LL=30 Pl=16 LS=7.5	1.50m D	62.8	1.0	[Cross-hatched pattern]	FILL: Silty CLAY: (CH) brown-grey, trace pink-white gravel	D VSt	2.60: Pocket penetrometer unable to penetrate soil	
				2.20m U	61.8	2.00m		[Diagonal lines pattern]	Sandy CLAY: (CL) brown, fine to medium sand		VSt to H
				2.60m	60.8	3.0	[Diagonal lines pattern]		Silty CLAY: (CH) brown		
				3.70m D	59.8	4.0			Borehole terminated at 3.8m (Refusal)		
					58.8	5.0					
					57.8	6.0					
					56.8	7.0					
					55.8	8.0					
					54.8	9.0					

DRILLING				SAMPLES & FIELD TESTS				DENSITY (N-value)		CONSISTENCY (Su) {N-value}			
HA	Hand Auger	HQ	HQ Coring	D	Disturbed Sample	SPT	SPT Sample	VL	Very Loose	0 - 4	VS	Very Soft	< 12 kPa {0-2}
SFA	Solid Flight Auger	NQ	NQ Coring	B	Bulk Sample	U	Undisturbed Tube Sample	L	Loose	4 - 10	S	Soft	12 - 25 {2-4}
WB	Washbore	PQ	PQ Coring	ES	Env Soil Sample	W	Water Sample	MD	Medium Dense	10 - 30	F	Firm	25 - 50 {4-8}
RR	Rock Rolling	NMLC	NMLC Coring	EW	Env Water Sample			D	Dense	30 - 50	St	Stiff	50 - 100 {8-15}
AH	Air Hammer			PP	Hand Penetrometer			VD	Very Dense	50 - 100	VSt	Very Stiff	100 - 200 {15-30}
				SV	Hand Vane Shear						H	Hard	> 200 kPa {>30}

GROUNDWATER SYMBOLS		MOISTURE CONDITION	
▼	= Water level (static)	D	= Dry
▽	= Water level (during drilling)	M	= Moist
▶	= Water inflow	W	= Wet
◀	= Water outflow		

JACOBS AGS REV04 (WORKING) GLB Log SKM SOIL LOG - BOREHOLE LOGS.GPJ <-DrawingFile>> 10/12/2014 16:04

PROJECT : Mallee CMA - SDL Adjustment Project	JOB NO : IS079600	PAGE : 1 OF 1
POSITION : E: 717396, N: 6103597 (MGA94)	SURFACE ELEVATION : 63.500 (AHD)	LOCATION : Structure V1
RIG TYPE : 4WD Mounted	CONTRACTOR : Civitest Pty Ltd	DIP / AZIMUTH : 90°
DATE DRILLED : 29/10/14 to 29/10/14	LOGGED BY : JL	CHECKED BY : CJ
		STANDARD : AS1726-1993

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits							
AD Not Encountered								0.30m FILL: Silty CLAY: (CH) brown-grey, trace pink-white gravel	D	VSt	
								Silty CLAY: (CH) dark grey-brown		VSt to H	
					1.00m D	62.5	1.0				
					1.80m U	61.5	2.0		grey-brown	M	
					2.10m	61.5	2.0		trace fine sand		
				4.20m D	59.5	4.0					2.10: PP result = 5.3kg/cm <sup>2</sup> Vane shear unable to penetrate soil
					58.5	5.0		Borehole terminated at 5.0m (Target Depth)			
					57.5	6.0					
					56.5	7.0					
					55.5	8.0					
					54.5	9.0					

<b>DRILLING</b> HA Hand Auger HQ HQ Coring SFA Solid Flight Auger NQ NQ Coring WB Washbore PQ PQ Coring RR Rock Rolling NMLC NMLC Coring AH Air Hammer	<b>SAMPLES &amp; FIELD TESTS</b> D Disturbed Sample SPT SPT Sample B Bulk Sample U Undisturbed Tube Sample ES Env Soil Sample W Water Sample EW Env Water Sample PP Hand Penetrometer SV Hand Vane Shear (P: Peak Su R: Residual Su) N SPT blows per 300mm HW SPT penetration by hammer weight RW SPT penetration by rod weight	<b>DENSITY (N-value)</b> VL Very Loose 0 - 4 L Loose 4 - 10 MD Medium Dense 10 - 30 D Dense 30 - 50 VD Very Dense 50 - 100	<b>CONSISTENCY (Su) {N-value}</b> VS Very Soft < 12 kPa {0-2} S Soft 12 - 25 {2-4} F Firm 25 - 50 {4-8} St Stiff 50 - 100 {8-15} VSt Very Stiff 100 - 200 {15-30} H Hard > 200 kPa {>30}
<b>GROUNDWATER SYMBOLS</b> ▽ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow	<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet		

JACOBS AGS REV04 (WORKING) GJB Log SKM SOIL LOG - BOREHOLE LOGS.GPJ <-DrawingFile>> 10/12/2014 16:04





**VN-BH02- (Vinifera Drop Structure):**



Borehole Setup



STP Depth 1.5-1.95m



STP Depth 3.0-3.45m



STP Depth 4.5-4.95m

**VN-BH02- (Vinifera Drop Structure):**



STP Depth 4.5-4.95m, close up view



STP Depth 6.0-6.45m

PROJECT : Mallee CMA - SDL Adjustment Project	JOB NO : IS079600	PAGE : 1 OF 1
POSITION : E: 720288, N: 6101567 (MGA94)	SURFACE ELEVATION : 65.400 (AHD)	LOCATION : Structure V1
RIG TYPE : 4WD Mounted	CONTRACTOR : Civitest Pty Ltd	DIP / AZIMUTH : 90°
DATE DRILLED : 29/10/14 to 29/10/14	LOGGED BY : JL	CHECKED BY : CJ
		STANDARD : AS1726-1993

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits								
Not Encountered								0.20m FILL: Clayey SILT: (ML) brown, with fine sand		D	D	
						64.4	1.0	Sandy SILT: (ML) dark grey-brown, trace pink-white gravel brown				
						63.4	2.0	dark grey				
	5.9		32	LL=23 Pl=9 LS=4.5	3.50m D	62.4	3.0	3.00m Clayey SAND (SC) dark brown, fine to coarse grained sand, low to medium plasticity fines				
	14.6		58	LL=47 Pl=30 LS=13	4.00m U	61.4	4.0	3.80m Sandy CLAY: (CI) dark brown, fine to medium sand		M	VSt to H	
				4.45m	60.4	5.0						4.45: Pocket penetrometer unable to penetrate soil Vane shear unable to penetrate soil
				5.50m D	59.4	6.0	5.40m Silty CLAY: (CH) brown-grey, trace sand					
					58.4	7.0	6.50m	Borehole terminated at 6.5m (Refusal)				
					57.4	8.0						
					56.4	9.0						

<b>DRILLING</b> HA Hand Auger HQ HQ Coring SFA Solid Flight Auger NQ NQ Coring WB Washbore PQ PQ Coring RR Rock Rolling NMLC NMLC Coring AH Air Hammer	<b>SAMPLES &amp; FIELD TESTS</b> D Disturbed Sample SPT SPT Sample B Bulk Sample U Undisturbed Tube Sample ES Env Soil Sample W Water Sample EW Env Water Sample PP Hand Penetrometer SV Hand Vane Shear N SPT blows per 300mm HW SPT penetration by hammer weight RW SPT penetration by rod weight	<b>DENSITY (N-value)</b> VL Very Loose 0 - 4 L Loose 4 - 10 MD Medium Dense 10 - 30 D Dense 30 - 50 VD Very Dense 50 - 100	<b>CONSISTENCY (Su) {N-value}</b> VS Very Soft < 12 kPa {0-2} S Soft 12 - 25 {2-4} F Firm 25 - 50 {4-8} St Stiff 50 - 100 {8-15} VSt Very Stiff 100 - 200 {15-30} H Hard > 200 kPa {>30}
<b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow	<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet		

JACOBS AGS REV04 (WORKING) G.L.B. Log SKM SOIL LOG - BOREHOLE LOGS.GPJ <-DrawingFiles> 10/12/2014 16:04





PROJECT : Mallee CMA - SDL Adjustment Project JOB NO : IS079600 PAGE : 1 OF 1  
 POSITION : E: 720347, N: 6102790 (MGA94) SURFACE ELEVATION : 64.400 (AHD) LOCATION : Structure V4  
 RIG TYPE : 4WD Mounted CONTRACTOR : Civitest Pty Ltd DIP / AZIMUTH : 90°  
 DATE DRILLED : 31/10/14 to 31/10/14 LOGGED BY : JL CHECKED BY : CJ STANDARD : AS1726-1993

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits							
AD Not Encountered	16.3		LL=44 Pl=28 LS=11.5	0.80m U	63.4	1.0	0.40m FILL: Clayey SILT: (ML) brown, trace fine sand	D VSt			
				1.25m D	62.4	2.0	Silty CLAY: (CI) grey-brown	VSt to H	1.25: Pocket penetrometer unable to penetrate soil Vane shear unable to penetrate soil		
				2.20m D	61.4	3.0	dark grey, mottled brown	M H			
				3.00m U	60.4	4.0					
				3.25m D	59.4	5.0	Borehole terminated at 5.0m (Target Depth)		3.25: PP result = 5.4kg/cm <sup>2</sup> VS peak = 213kPa VS residual = 67kPa		
				4.50m D	58.4	6.0					
					57.4	7.0					
					56.4	8.0					
					55.4	9.0					

DRILLING				SAMPLES & FIELD TESTS				DENSITY (N-value)		CONSISTENCY (Su) {N-value}			
HA	Hand Auger	HQ	HQ Coring	D	Disturbed Sample	SPT	SPT Sample	VL	Very Loose	0 - 4	VS	Very Soft	< 12 kPa {0-2}
SFA	Solid Flight Auger	NQ	NQ Coring	B	Bulk Sample	U	Undisturbed Tube Sample	L	Loose	4 - 10	S	Soft	12 - 25 {2-4}
WB	Washbore	PQ	PQ Coring	ES	Env Soil Sample	W	Water Sample	MD	Medium Dense	10 - 30	F	Firm	25 - 50 {4-8}
RR	Rock Rolling	NMLC	NMLC Coring	EW	Env Water Sample			D	Dense	30 - 50	St	Stiff	50 - 100 {8-15}
AH	Air Hammer			PP	Hand Penetrometer			VD	Very Dense	50 - 100	VSt	Very Stiff	100 - 200 {15-30}
				SV	Hand Vane Shear						H	Hard	> 200 kPa {>30}

GROUNDWATER SYMBOLS		MOISTURE CONDITION	
▼	= Water level (static)	D	= Dry
▽	= Water level (during drilling)	M	= Moist
▶	= Water inflow	W	= Wet
◀	= Water outflow		

JACOBS AGS REV04 (WORKING) GLB Log SKM SOIL LOG - BOREHOLE LOGS.GPJ <-DrawingFile> 10/12/2014 16:04

PROJECT : Mallee CMA SDL Advanced Concept Design      JOB NO : IS079600 WBS#002      PAGE : 1 OF 1  
 POSITION : E: 711711.000, N: 6136858.000 (MGA94)      SURFACE ELEVATION :      LOCATION : Burra Creek  
 EQUIPMENT TYPE : Case CX36B Excavator (3.6t)      CONTRACTOR : Ashley J Shirnack Contracting      BUCKET WIDTH : 0.35m  
 DATE EXCAVATED : 24/10/14 to 24/10/14      LOGGED BY : IW      CHECKED BY :      STANDARD :

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
E								ROAD BASE (FILL): sandy silty CLAY (CI): grey	S - F		5 10 15 20	0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted	
					0.30m			sandy silty CLAY (CH) dark grey, with some grey sand layers 10mm thick					
					0.50m B-2 bags 0.60m	-0.5		red brown sands between 0.5 and 1.0m depth. Possibly eroded from higher red sandy ground.					
					1.30m B-2 bags 1.40m	-1.0		sandy silty CLAY (CI): mottled dark grey with yellow staining, with some 20-30mm charcoal fragments and burnt earth that appear to both be from fire induced collapse of channel bank.	D				
					1.80m	-1.5		sandy silty CLAY (CI): grey with yellow grey mottling	VSt				
					2.10m B-2 bags 2.20m	-2.0		with some charcoal and fine white particles (gypsum)					
					2.30m B-2 bags 2.40m B-2 bags 2.50m	-2.5		silty clayey SAND (SC): fine grained, mottled pale grey and yellow				2.40: Increase in excavator resistance	
				2.70m B-2 bags	-2.7		pale grey, with some clay						
							End of test pit at 2.70m						

<b>EXCAVATION</b> N Natural/Existing cutting    B Bulldozer E Excavator    R Ripper BH Backhoe Bucket		<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample    U Undisturbed Tube Sample D Small Disturbed Sample    W Water Sample ES Env Soil Sample EW Env Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)		<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact		<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)	
<b>GROUNDWATER SYMBOLS</b> ▽ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow		<b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<b>MOISTURE CONDITION</b> D = Dry    M = Moist    W = Wet			

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30 10 2014.GPJ <<DrawingFile>> 09/12/2014 15:40

PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 711723.000, N: 6136840.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Burra Creek
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 24/10/14 to 24/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
E D 0.40m								EMBANKMENT FILL: clayey SAND red					0.00: Embankment and imported fill material. Hand Penetrometer tests > 6 kg/cm <sup>2</sup>
						0.30m		silty sandy CLAY (SC): dark grey, with some Fe/Mn concretions					0.30: Inferred creek bed
						0.40m		End of test pit at 0.4m					

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket B Bulldozer R Ripper  <b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample U Undisturbed Tube Sample W Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)  <b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact  <b>MOISTURE CONDITION</b> D = Dry   M = Moist   W = Wet	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
--	--	---	--

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <<DrawingFile>> 09/12/2014 15:40

PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 711737.000, N: 6136812.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Burra Creek
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 24/10/14 to 24/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
					0.30m B-2 bags 0.40m				silty sandy CLAY (CI): dark grey, trace roots and charcoal	D	St - VSt	5 10 15 20	0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted
					1.00m B-2 bags 1.10m	-0.5			SAND (SP) fine grained, grey to yellow, with some silt, trace clay, 1-2mm carbonate nodules	D - M			0.25: Soil excavated in 50-150mm broken clods
					1.50m B-2 bags 1.60m	-1.0			silty sandy CLAY (CI): grey to yellow, sand is fine grained	D	VSt - H		1.40: Increase in excavator resistance
					2.10m B-2 bags 2.20m	-1.5			Fe/Mn staining 2-5%	D	H		1.70: Increase in excavator resistance
						-2.0			End of Test Pit at 2.3m				

<b>EXCAVATION</b> N Natural/Existing cutting B Bulldozer E Excavator R Ripper BH Backhoe Bucket		<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample U Undisturbed Tube Sample D Small Disturbed Sample W Water Sample ES Env Soil Sample EW Env Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)		<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact		<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)	
<b>GROUNDWATER SYMBOLS</b> ▽ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow		<b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet			



PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 711895.000, N: 6136697.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Burra Creek
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 24/10/14 to 24/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
↑ E ↓													
					0.60m B-2 bags 0.70m	-0.5		silty sandy CLAY (CH) dark grey, slickensides (expansive). 1-2m diameter Gilgai holes developed at surface.  with some 3-5mm small carbonate (calcrete) nodules, inferred expansive and dispersive clay	D	VSt	5 10 15 20	0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted	
					1.00m D-1 bag	-1.0		sample for plasticity and linear shrinkage					
					1.10m	-1.05		End of Test Pit at 1.05m					
						-1.5							
						-2.0							
						-2.5							

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket  <b>GROUNDWATER SYMBOLS</b> ▼ = Water level (static) ▽ = Water level (during drilling) ► = Water inflow ◄ = Water outflow	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample  U Undisturbed Tube Sample W Water Sample  HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)  PHOTOGRAPHS NOTES <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact  <b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
---	---	---	--

PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 712145.000, N: 6136616.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Burra Creek
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 24/10/14 to 24/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
E					0.50m D-1 bag	-0.5	[Hatched Pattern]	silty CLAY (CH): mottled yellow to grey, with some fine grained sand, with some Fe/Mn gravels/concretions	D	D	5	0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted	
					0.60m								
					1.00m D-1 bag	-1.0		roots	D - M				
					1.10m			clayey SAND (SC): yellow with yellow grey mottling					1.00: Hand Penetrometer test 4.6 and 5.2 kg/cm <sup>2</sup>
					1.50m D-1 bag	-1.5		End of test pit at 1.50m					
					1.60m								

<b>EXCAVATION</b> N Natural/Existing cutting B Bulldozer E Excavator R Ripper BH Backhoe Bucket		<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample U Undisturbed Tube Sample D Small Disturbed Sample W Water Sample ES Env Soil Sample EW Env Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)		<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact		<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)	
<b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow		<b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet			

JACOBS AGS REV04 (WORKING) GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFile> 09/12/2014 15:40



PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 712346.000, N: 6136337.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Burra Creek
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 24/10/14 to 24/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
E					0.50m D-1 bag	-0.5		silty CLAY (CH): dark grey, with some fine grained sand  with some roots at 0.15m	S - F		5 10 15 20	0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted	
					0.60m	-1.0		yellow to grey-dark grey, with some gypsum, trace carbonate nodules <2%, slickensides, inferred expansive clay  silty, sandy CLAY (CH-Cl): increase in yellow grey mottle at 1.0m.	D VSt - H				
					1.20m D-1 bag	-1.25		End of test pit at 1.25m					1.20: Hand Penetrometer test 5.5 kg/cm <sup>2</sup>
					1.30m	-1.30							

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket  <b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample  U Undisturbed Tube Sample W Water Sample  HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)  PHOTOGRAPHS NOTES <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact  <b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
---	---	---	--

JACOBS AGS REV04 (WORKING) G.L.B. Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <<DrawingFile>> 09/12/2014 15:40



PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 712569.000, N: 6136054.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Burra Creek
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 24/10/14 to 24/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
								ROAD FILL: CLAY/SAND pale grey to yellow, with some silt	D	St		0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted	
						0.15m		silty sandy CLAY (CI): dark grey					
						0.5		trace roots					
						1.00m		slickensides observed, inferred expansive clay	M	VSt			
						1.00m		End of test pit at 1.0m				1.00: Hand Penetrometer test 5.3kg/cm <sup>2</sup>	

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket B Bulldozer R Ripper  <b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample U Undisturbed Tube Sample W Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)  <b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact  <b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
--	--	---	--

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <<DrawingFile>> 09/12/2014 15:41

PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 712733.000, N: 6135122.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Burra Creek
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 24/10/14 to 24/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
↑ E ↓								TOPSOIL: silty sandy CLAY (CI); pale grey and yellow grey mottle, sand is fine grained	M	VSt - H	5	0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted	
						0.20m		silty sandy CLAY (CH) dark grey, trace roots and carbonate nodules		D - M	10		
						0.60m D-1 bag		slickensides, inferred expansive soil		VSt	15		
						0.70m		slickensides closely space 20-30mm, inferred highly expansive clay, 1-2% carbonate concretions 2-5mm diameter.		M	20		
					1.00m D-1 bag	1.00m		End of test pit at 1.0m					
					1.10m								

<p><b>EXCAVATION</b></p> <p>N Natural/Existing cutting E Excavator BH Backhoe Bucket</p> <p><b>GROUNDWATER SYMBOLS</b></p> <p>▼ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow</p>	<p><b>SAMPLES &amp; FIELD TESTS</b></p> <p>B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample</p> <p>U Undisturbed Tube Sample W Water Sample</p> <p>HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)</p> <p><b>PHOTOGRAPHS NOTES</b></p> <p><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>	<p><b>DENSITY</b></p> <p>VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact</p> <p><b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet</p>	<p><b>CONSISTENCY (Su)</b></p> <p>VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (&gt;200kPa)</p>
---	--	--	---

JACOBS AGS REV04 (WORKING) G.LB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFiles> 09/12/2014 15:41

PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 712783.000, N: 6134825.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Burra Creek
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 24/10/14 to 24/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
<div style="border: 1px solid black; padding: 2px;">                     E  </div>						0.20m	TOPSOIL: silty sandy CLAY (CI); yellow and grey mottle, insect burrows observed, roots at 0.2m.	D	St - VSt	5		0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted	
						0.5m	silty sandy CLAY (CH); dark grey	D - M	VSt	10			
						0.60m D-1 bag	0.70m	slickensides and decayed roots at 0.6m			15		0.60: Hand Penetrometer test 5.5->6kg/cm <sup>2</sup>
						1.00m D-1 bag	1.10m	slickensides closely space 20-30mm, inferred highly expansive clay	M	St	20		
						1.00m	End of test pit at 1.0m						

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFile> 09/12/2014 15:41

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket  <b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample U Undisturbed Tube Sample W Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)  <b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact  <b>MOISTURE CONDITION</b> D = Dry   M = Moist   W = Wet	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
---	--	---	--

PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 712958.000, N: 6134590.000 ( MGA94)	SURFACE ELEVATION :	LOCATION : Burra Creek
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 24/10/14 to 24/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
↑ E ↓					0.20m D-1 bag				TOPSOIL: silty sandy CLAY (CI); pale grey and yellow grey mottle, grass roots	D	S - F		0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted
					0.30m			0.35m silty sandy CLAY (CI); dark grey, 2% carbonate nodules 2-7mm diameter					
					0.60m D-1 bag		-0.5			M	VSt		
					0.70m		-1.0		1.00m slickensides, inferred expansive clay				
							-1.5		End of test pit at 1.0m				
							-2.0						
							-2.5						

<p><b>EXCAVATION</b></p> <p>N Natural/Existing cutting B Bulldozer E Excavator R Ripper BH Backhoe Bucket</p> <p><b>GROUNDWATER SYMBOLS</b></p> <p>▼ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow</p>	<p><b>SAMPLES &amp; FIELD TESTS</b></p> <p>B Bulk Sample U Undisturbed Tube Sample D Small Disturbed Sample W Water Sample ES Env Soil Sample EW Env Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)</p> <p><b>PHOTOGRAPHS NOTES</b></p> <p><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>	<p><b>DENSITY</b></p> <p>VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact</p> <p><b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet</p>	<p><b>CONSISTENCY (Su)</b></p> <p>VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (&gt;200kPa)</p>
--	--	--	---

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <<DrawingFile>> 09/12/2014 15:41



PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 712093.000, N: 6131923.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Burra Creek
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 24/10/14 to 24/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
E													
					0.50m D-1 bag	-0.5		FILL: silty sandy CLAY (CH): dark grey, with some red sand lenses	D	F			0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted
					0.60m								
					1.00m D-1 bag	-1.0		0.70m silty sandy CLAY (CH): high plasticity, dark grey					
					1.10m								
					1.50m D-1 bag	-1.5		grey to dark grey, medium plasticity					
					1.60m			yellow grey, with some gypsum and carbonate concretions, slickensides observed, inferred expansive clay	M	VSt			
					2.00m D-1 bag	-2.0							
					2.10m D-1 bag	-2.1		yellow mottle (5%), increase in carbonate nodules (5-10%), trace roots					2.10: Complex stratigraphy inferred old channel deposits
					2.20m			slickensides, inferred expansive clay					
				2.50m D-1 bag	-2.5		2.40m silty sandy CLAY (CH): grey with red grey mottle						
				2.60m D-1 bag	-2.6								
				2.70m	-2.7		2.70m End of test pit at 2.7m						

<b>EXCAVATION</b> N Natural/Existing cutting B Bulldozer E Excavator R Ripper BH Backhoe Bucket	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample U Undisturbed Tube Sample D Small Disturbed Sample W Water Sample ES Env Soil Sample EW Env Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
<b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow	<b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet	

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFile> 09/12/2014 15:41

PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 712173.000, N: 6131921.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Burra Creek
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 24/10/14 to 24/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		


EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
					1.00m B-2 bag	-1.0			LEVEE FILL: silty sandy CLAY (CI): dark grey, with some sand			5 10 15 20	0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted
					1.10m								
					1.70m 1.60m D-1 bag	-1.5			buried leaf matter and tree branches (inferred old surface) roots				1.70: Hand Pentrometer tests 5.5 to > 6 kg/cm <sup>2</sup>
						-2.0			slickensides observed, inferred expansive clay				
						-2.5			pale grey to grey, sluphur odour				
						-2.80m			End of test pit at 2.8m				





<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket  <b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)  U Undisturbed Tube Sample W Water Sample  PHOTOGRAPHS NOTES <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact  <b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
---	---	---	--

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ &lt;DrawingFile&gt; 09/12/2014 15:41



PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 712754.000, N: 6121990.000 ( MGA94)	SURFACE ELEVATION :	LOCATION : Burra Creek
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 24/10/14 to 24/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
					D 0.10m			silty clayey SAND (SC): dark grey 0.10m End of test pit at 0.1m			5 10 15 20	0.00: Surface of creek bed. Spade sample collected. No penetration of 19mm Vane Shear	
						-0.5							
						-1.0							
						-1.5							
						-2.0							
						-2.5							

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket B Bulldozer R Ripper	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample U Undisturbed Tube Sample W Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
<b>GROUNDWATER SYMBOLS</b>  = Water level (static)  = Water level (during drilling)  = Water inflow  = Water outflow	<b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>MOISTURE CONDITION</b> D = Dry   M = Moist   W = Wet	

JACOBS AGS REV04 (WORKING) GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFile> 09/12/2014 15:41

PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 712738.000, N: 6121981.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Burra Creek
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 24/10/14 to 24/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
						0.30m		FILL: SAND (50%) CLAY (50%) sand is red, clay is grey		D - F			0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted
						0.50m D-1 bag		CLAY (CH): mottled pale grey and red brown, with Fe/Mn concretions		D			0.30: inferred natural
						0.60m							
						1.10m D-1 bag		CLAY (CH): grey, inferred expansive					
						1.20m		increase in soil moisture					
										VSt			
								roots observed, slickensided, inferred highly expansive clay		M			
								with some gypsum crystals in clay					
						2.80m D-1 bag		End of test pit at 2.8m					
						2.90m							

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket B Bulldozer R Ripper	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample U Undisturbed Tube Sample W Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
<b>GROUNDWATER SYMBOLS</b> ▽ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow	<b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet	

JACOBS AGS REV04 (WORKING) G.L.B. Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFile> 09/12/2014 15:41





PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 714264.000, N: 6112583.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Nyah North
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 23/10/14 to 23/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
E					0.20m D-1 bag				silty CLAY (CH): with some fine sand, inferred alluvial deposit	D	St - VSt	5 10 15 20	0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted
					0.30m								
					0.40m				CLAY (CH): dark grey and yellow brown mottled, inferred expansive clay	M	VSt		
					0.95m D-1 bag				trace carbonate nodules				
					1.00m				End of test pit at 1.0m				

<b>EXCAVATION</b> N Natural/Existing cutting B Bulldozer E Excavator R Ripper BH Backhoe Bucket				<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample U Undisturbed Tube Sample D Small Disturbed Sample W Water Sample ES Env Soil Sample EW Env Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)				<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact		<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)	
<b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow				<b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO				<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet			

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <<DrawingFile>> 09/12/2014 15:41

PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 714534.000, N: 6112495.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Nyah North
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 23/10/14 to 23/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
↑ E ↓							0.20m	ROAD FILL (FILL): Mixture of graded red and dark grey CLAY	D	F	5	0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted	
							0.5	silty CLAY (CI): medium plasticity, mottled dark grey and red brown, slickensides observed, inferred expansive clay  dark grey  mottled	D	St	10		
					1.00m DZ small bags		1.00m	End of test pit at 1.0m	W	VSt	15	0.80: Hand penetrometer test 4.4 kg/cm <sup>2</sup> Vane Shear 115/18 kPa, 183/29 kPa	
							1.5						
							2.0						
							2.5						

<p><b>EXCAVATION</b></p> <p>N Natural/Existing cutting E Excavator BH Backhoe Bucket</p> <p>B Bulldozer R Ripper</p> <p><b>GROUNDWATER SYMBOLS</b></p> <p>▼ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow</p>	<p><b>SAMPLES &amp; FIELD TESTS</b></p> <p>B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample</p> <p>U Undisturbed Tube Sample W Water Sample</p> <p>HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)</p> <p>PHOTOGRAPHS NOTES <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>	<p><b>DENSITY</b></p> <p>VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact</p> <p><b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet</p>	<p><b>CONSISTENCY (Su)</b></p> <p>VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (&gt;200kPa)</p>
---	--	--	---



PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 714709.000, N: 6112155.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Nyah North
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 23/10/14 to 23/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
↑ E ↓								ROAD MIX (FILL): Mixture of graded red and dark grey CLAY	D	S			0.40: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> No penetration of 19mm Vane Shear unless noted
						0.20m		CLAY (CI): medium plasticity, grey with red brown mottle, roots	D	F			
						1.00m	1.00m	End of test pit at 1.0m	M	St			

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket B Bulldozer R Ripper	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample U Undisturbed Tube Sample W Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
<b>GROUNDWATER SYMBOLS</b> ▽ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow	PHOTOGRAPHS NOTES <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet	

JACOBS AGS REV04 (WORKING) GJB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFile> 09/12/2014 15:41





PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 714789.000, N: 6112053.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Nyah North
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 23/10/14 to 23/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
					0.50m B-3 bags 0.60m	0.5		silty CLAY (CI): dark grey with red brown mottle, inferred channel fill	D	F	5 10 15 20	0.40: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted	
						0.65m		silty CLAY (CH): grey brown, with some carbonate nodules on fissures, slickensides observed, inferred expansive clays				0.70: Hand Penetrometer tests 5.8-6 kg/cm <sup>2</sup> Vane shear 215/29 kPa	
						1.90m B-3 small bags 2.00m	1.5		silty CLAY (CH): yellow grey with yellow mottle, slickensides observed, inferred highly expansive clay		S <sub>z</sub>		1.50: Vane shear 135/18 kPa
						2.80m B-3 small bags 2.85m	2.0	grey to yellow grey  yellow brown, 0.2m diameter mottles		M			
							2.5				VSt - H		
							2.85m	End of test pit at 2.85m (refusal)					

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket B Bulldozer R Ripper	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample U Undisturbed Tube Sample W Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) MD Medium Dense (25-50kPa) F Firm (50-100kPa) St Stiff (100-200kPa) VSt Very Stiff (>200kPa) H Hard (>200kPa)	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) MD Medium Dense (25-50kPa) F Firm (50-100kPa) St Stiff (100-200kPa) VSt Very Stiff (>200kPa) H Hard (>200kPa)
<b>GROUNDWATER SYMBOLS</b> ▽ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow	PHOTOGRAPHS NOTES <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet	

JACOBS AGS REV04 (WORKING) GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFile> 09/12/2014 15:41

PROJECT : Mallee CMA SDL Advanced Concept Design NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 714821, N: 6111972 (MGA94) SURFACE ELEVATION :	LOCATION : Nyah North
RIG TYPE : Case CX36B Excavator (3.6t) CONTRACTOR : Ashley J Shirnack Contracting	DIP / AZIMUTH : 90°
DATE DRILLED : 23/10/14 to 23/10/14 LOGGED BY : IW CHECKED BY :	STANDARD :

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY		COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits								
↑ E ↓								0.00-0.30m silty CLAY (Cl); medium plasticity, dark grey	D	S-F	0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted	
						0.30-1.00m		CLAY (CH); dark grey	M	St	0.40: Hand Penetrometer tests 5.3 kg/cm <sup>2</sup>	
						1.00-1.60m		End of test pit at 1.0m			0.90: inferred increase in soil compaction	
				1.60m 1.10m D-1 small bag								

<b>DRILLING</b> HA Hand Auger HQ HQ Coring SFA Solid Flight Auger NQ NQ Coring WB Washbore PQ PQ Coring RR Rock Rolling NMLC NMLC Coring AH Air Hammer	<b>SAMPLES &amp; FIELD TESTS</b> D Disturbed Sample SPT SPT Sample B Bulk Sample U Undisturbed Tube Sample ES Env Soil Sample W Water Sample EW Env Water Sample PP Hand Penetrometer SV Hand Vane Shear (P: Peak Su R: Residual Su) N SPT blows per 300mm HW SPT penetration by hammer weight RW SPT penetration by rod weight	<b>DENSITY (N-value)</b> VL Very Loose 0 - 4 L Loose 4 - 10 MD Medium Dense 10 - 30 D Dense 30 - 50 VD Very Dense 50 - 100	<b>CONSISTENCY (Su) {N-value}</b> VS Very Soft < 12 kPa {0-2} S Soft 12 - 25 {2-4} F Firm 25 - 50 {4-8} St Stiff 50 - 100 {8-15} VSt Very Stiff 100 - 200 {15-30} H Hard > 200 kPa {>30}
<b>GROUNDWATER SYMBOLS</b> ▼ = Water level (static) ▽ = Water level (during drilling) ► = Water inflow ◄ = Water outflow	<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet		



PROJECT : Mallee CMA SDL Advanced Concept Design	NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 716990, N: 6107069 (MGA94)	SURFACE ELEVATION :	LOCATION : Nyah South
RIG TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	DIP / AZIMUTH : 90°
DATE DRILLED : 23/10/14 to 23/10/14	LOGGED BY : IW	CHECKED BY :
		STANDARD :

DRILLING & WATER DETAIL	LAB DATA				SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE / CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits							
							0.10m	ROAD FORMATION (FILL): Mixture of gravel, sand and calcrete, red brown	D VSt	0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted	
								0.50m	silty sandy CLAY (CI): mottled grey and red brown, with some Fe/Mn nodules		VSt - H
								0.70m	silty sandy CLAY (CI): dark grey with red grey mottle, fine sand lenses, with some Fe/Mn nodules (lightly cemented)	D - M VSt	
								1.40m	pale grey and yellow brown mottles, sand lenses 4-5mm thick and irregular, with some charcoal	M	
								1.50m	increase in soil moisture		
							1.90m	increase in yellow mottle			
							2.00m	increase in sand, fine to medium grained			1.80: Inferred creek bed
							2.50m	light grey and yellow mottle, sandy silty CLAY to clayey SAND with silt			
							2.70m	End of test pit at 2.7m			

<b>DRILLING</b> HA Hand Auger    HQ HQ Coring SFA Solid Flight Auger    NQ NQ Coring WB Washbore    PQ PQ Coring RR Rock Rolling    NMLC NMLC Coring AH Air Hammer	<b>SAMPLES &amp; FIELD TESTS</b> D Disturbed Sample    SPT SPT Sample B Bulk Sample    U Undisturbed Tube Sample ES Env Soil Sample    W Water Sample EW Env Water Sample PP Hand Penetrometer SV Hand Vane Shear    MOISTURE CONDITION (P: Peak Su R: Residual Su)    D = Dry    M = Moist    W = Wet N SPT blows per 300mm HW SPT penetration by hammer weight RW SPT penetration by rod weight	<b>DENSITY (N-value)</b> VL Very Loose    0 - 4 L Loose    4 - 10 MD Medium Dense    10 - 30 D Dense    30 - 50 VD Very Dense    50 - 100	<b>CONSISTENCY (Su) {N-value}</b> VS Very Soft    < 12 kPa {0-2} S Soft    12 - 25 {2-4} F Firm    25 - 50 {4-8} St Stiff    50 - 100 {8-15} VSt Very Stiff    100 - 200 {15-30} H Hard    > 200 kPa {>30}
<b>GROUNDWATER SYMBOLS</b> ▼ = Water level (static) ▽ = Water level (during drilling) ► = Water inflow ◄ = Water outflow			

JACOBS AGS REV04 (WORKING) GJB Log SKM SOIL LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <<DrawingFile>> 10/12/2014 16:16



PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 716985.000, N: 6107048.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Nyah South
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 23/10/14 to 23/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
					0.30m D-1 bag				sandy silty CLAY (CI): mottled yellow grey and brown	VSt			0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted
					0.40m								
					1.00m D-1 bag		0.50m		silty sandy CLAY (CH): dark grey with red brown mottle				
					1.10m								
							1.0m			VSt - H			
							1.5m		grey with red brown mottle				
							1.70m		clayey SAND(SC)/silty CLAY (CI): pale grey with yellow mottle				
							2.00m D-1 bag		increase in clay content				
							2.10m						
							2.60m D-1 bag						
							2.60m		End of test pit at 2.6m				

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFile> 09/12/2014 15:41

<p><b>EXCAVATION</b></p> <p>N Natural/Existing cutting E Excavator BH Backhoe Bucket</p> <p>B Bulldozer R Ripper</p> <p><b>GROUNDWATER SYMBOLS</b></p> <p>▼ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow</p>	<p><b>SAMPLES &amp; FIELD TESTS</b></p> <p>B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample</p> <p>U Undisturbed Tube Sample W Water Sample</p> <p>HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)</p> <p><b>PHOTOGRAPHS NOTES</b></p> <p><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>	<p><b>DENSITY</b></p> <p>VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact</p> <p><b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet</p>	<p><b>CONSISTENCY (Su)</b></p> <p>VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (&gt;200kPa)</p>
---	--	--	---



PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 717145.000, N: 6103847.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Vinifera North
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 21/10/14 to 21/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
E					0.50m B	-0.5		CLAY (CH): dark grey with some brown mottle	D	S	5 10 15 20	0.00: No penetration of 19mm Vane Shear unless noted	
					0.70m	-0.7							M
						-1.0		1.00m End of test pit at 1.0m				0.60: Hand Penetrometer test > 6kg/cm <sup>2</sup>	
						-1.5							
						-2.0							
						-2.5							

<p><b>EXCAVATION</b></p> <p>N Natural/Existing cutting E Excavator BH Backhoe Bucket</p> <p><b>GROUNDWATER SYMBOLS</b></p> <p>▼ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow</p>	<p><b>SAMPLES &amp; FIELD TESTS</b></p> <p>B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample</p> <p>U Undisturbed Tube Sample W Water Sample</p> <p>HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)</p> <p><b>PHOTOGRAPHS NOTES</b></p> <p><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>	<p><b>DENSITY</b></p> <p>VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact</p> <p><b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet</p>	<p><b>CONSISTENCY (Su)</b></p> <p>VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (&gt;200kPa)</p>
---	--	--	---





PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 717383.000, N: 6103606.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Vinifera North
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 21/10/14 to 21/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
<div style="display: flex; align-items: center;"> <div style="width: 100%; border-left: 1px solid black; border-right: 1px solid black; margin: 0 5px;">E</div> <div style="width: 100%; border-left: 1px solid black; border-right: 1px solid black; margin: 0 5px;">N</div> </div>					0.30m	0.30m	TOPSOIL: CLAY (CI): grey brown, with grass roots		D	F	5	1.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted  1.20: Low digging resistance	
					D	0.5	CLAY (CI): mottled grey brown and yellow brown along fissures				10		
						0.70m	1.0	CLAY (CH): high plasticity, grey brown, with some silt		M	VSt		15
						2.00m	1.5	increase in soil moisture		M	F		20
					D	2.10m	End of test pit at 2.20m						
						2.20m							

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket  <b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample  U Undisturbed Tube Sample W Water Sample  HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)  PHOTOGRAPHS NOTES <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact  <b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
---	---	---	--

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ &lt;&lt;DrawingFile&gt;&gt; 09/12/2014 15:41

PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 717594.000, N: 6103574.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Vinifera North
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 21/10/14 to 21/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
↑ E ↓						0.00	0.00	SOIL: CLAY (CI): grey brown, with grass roots	D	F	5	0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted	
						0.50	0.50	silty CLAY (CH): high plasticity, grey brown with red brown mottle	M	St - VSt	10	0.50: Hand Penetrometer 4.6, 5.5, 5.2 kg/cm <sup>2</sup>	
						1.00	1.00	End of test pit at 1.0m					

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket B Bulldozer R Ripper	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample U Undisturbed Tube Sample W Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
<b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow	<b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet	

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFile> 09/12/2014 15:41





PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 720351.000, N: 6102810.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Vinifera South
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 21/10/14 to 21/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
E					0.30m B-3 bags 0.40m	0.00			sandy silty CLAY (CL): low to medium plasticity, mottled grey brown and red brown	F			0.00: Hand Penetrometer tests > 6 kg/cm <sup>2</sup> unless noted No penetration of 19mm Vane Shear unless noted
					1.00m B-3 bags 1.10m	0.80			CLAY (CH): high plasticity, dark grey	D			1.40: Hand Penetrometer 3.8, 5.3, 5.2 kg/cm <sup>2</sup>
					1.30m B-3 bags 1.40m	1.30			CLAY (CH): high plasticity, dark grey to grey, slickensides evident, inferred expansive clay	D			2.25: Hand Penetrometer 5.8, 5.6 >6 kg/cm <sup>2</sup>
					2.60m B-2 bags 2.70m	2.70			dark grey to grey with yellow, with some carbonate nodules (soft)	St			
								End of test pit at 2.70m					

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFile> 09/12/2014 15:41

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket B Bulldozer R Ripper	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample U Undisturbed Tube Sample W Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
<b>GROUNDWATER SYMBOLS</b> ▼ = Water level (static) ▽ = Water level (during drilling) ► = Water inflow ◄ = Water outflow	<b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>MOISTURE CONDITION</b> D = Dry    M = Moist    W = Wet	

PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 720348.000, N: 6102806.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Vinifera South
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 21/10/14 to 21/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
					B				sandy CLAY (CI); medium plasticity, mottled red brown to grey brown	D	H	5 10 15 20	0.00: Creek bed, surface sample only Vane shear cannot penetrate
					0.30m	0.30m			End of test pit at 0.3m				
						-0.5							
						-1.0							
						-1.5							
						-2.0							
						-2.5							

<p><b>EXCAVATION</b></p> <p>N Natural/Existing cutting E Excavator BH Backhoe Bucket</p> <p><b>GROUNDWATER SYMBOLS</b></p> <p>▼ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow</p>	<p><b>SAMPLES &amp; FIELD TESTS</b></p> <p>B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample</p> <p>U Undisturbed Tube Sample W Water Sample</p> <p>HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)</p> <p><b>PHOTOGRAPHS NOTES</b></p> <p><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>	<p><b>DENSITY</b></p> <p>VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact</p> <p><b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet</p>	<p><b>CONSISTENCY (Su)</b></p> <p>VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (&gt;200kPa)</p>
---	--	--	---

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFile> 09/12/2014 15:41



PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 720286.000, N: 6101563.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Vinifera South
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 21/10/14 to 21/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
↑ E ↓					0.40m B-3 bags 0.50m	-0.5		CLAY (CH): mottled grey and red brown		M	VSt	5 10 15 20	0.30: Hand Penetrometer test > 6 kg/cm <sup>2</sup> No penetration of 19mm Vane Shear
								CLAY (CI): pale grey to grey with red mottle, with some sand, carbonate deposits in fissures					
						-1.0		End of test pit at 1.0m					
						-1.5							
						-2.0							
						-2.5							

<b>EXCAVATION</b> N Natural/Existing cutting B Bulldozer E Excavator R Ripper BH Backhoe Bucket		<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample U Undisturbed Tube Sample D Small Disturbed Sample W Water Sample ES Env Soil Sample EW Env Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)		<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact		<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)	
<b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow		<b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet			

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFile> 09/12/2014 15:41

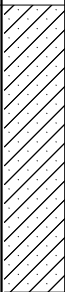

PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 720255.000, N: 6101579.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Vinifera South
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 21/10/14 to 21/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		





EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
			40	LL=32 Pl=17 LS=8.5	B-2 bags								
						-0.5							
						-1.0				M	S - F		
						-1.5							
						-2.0	2.00m		FILL: Mixture of CLAY, SAND and building materials clay is red and grey, sand is red				0.00: Hand Penetrometer test > 6 kg/cm <sup>2</sup> No penetration of 19mm Vane Shear
						-2.5							

<p><b>EXCAVATION</b></p> <p>N Natural/Existing cutting E Excavator BH Backhoe Bucket</p> <p>B Bulldozer R Ripper</p> <p><b>GROUNDWATER SYMBOLS</b></p> <p>▼ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow</p>	<p><b>SAMPLES &amp; FIELD TESTS</b></p> <p>B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample</p> <p>U Undisturbed Tube Sample W Water Sample</p> <p>HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)</p> <p>PHOTOGRAPHS NOTES <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>	<p><b>DENSITY</b></p> <p>VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact</p> <p><b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet</p>	<p><b>CONSISTENCY (Su)</b></p> <p>VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (&gt;200kPa)</p>
---	--	--	---

JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFiles> 09/12/2014 15:41

PROJECT : Mallee CMA SDL Advanced Concept Design	JOB NO : IS079600 WBS#002	PAGE : 1 OF 1
POSITION : E: 720278.000, N: 6101562.000 (MGA94)	SURFACE ELEVATION :	LOCATION : Vinifera South
EQUIPMENT TYPE : Case CX36B Excavator (3.6t)	CONTRACTOR : Ashley J Shirnack Contracting	BUCKET WIDTH : 0.35m
DATE EXCAVATED : 21/10/14 to 21/10/14	LOGGED BY : IW	CHECKED BY :
STANDARD :		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
<div style="text-align: center;">E</div>						0.50m D	0.5		silty clayey SAND (SC): dark grey, with some topsoil and humus	L	M	5 10 15 20	0.00: Test pit located on the edge of a slope of an old billabong. No penetration of 19mm Vane Shear unless noted  0.30: Hand Penetrometer 3.2, 3.5, 3.5 kg/cm <sup>2</sup>
					0.60m D	0.60m							
					0.80m D				black				
					0.90m D	1.00m	1.00m		End of test pit at 1.0m				

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket B Bulldozer R Ripper	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample U Undisturbed Tube Sample W Water Sample HP Hand Penetrometer (UCS result) HV Hand Vane Shear (P: Peak Su, R: Residual Su)	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
<b>GROUNDWATER SYMBOLS</b>  = Water level (static)  = Water level (during drilling)  = Water inflow  = Water outflow	<b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>MOISTURE CONDITION</b> D = Dry   M = Moist   W = Wet	

JACOBS AGS REV04 (WORKING) G.L.B. Log SKM TEST PIT LOG MALLEE TEST PIT LOGS 30.10.2014.GPJ <DrawingFile> 09/12/2014 15:41



PROJECT : Nyah Burra Vinifera	JOB NO : IS135300	PAGE : 1 OF 1
POSITION : E: 720205.000, N: 6101623.000 (54 MGA94)	SURFACE ELEVATION : 65.200 (AHD)	LOCATION : Vinifera Southern
EQUIPMENT TYPE : Backhoe (Cat 432D)	CONTRACTOR : Coburns Earthworks	BUCKET WIDTH : 0.4m
DATE EXCAVATED : 6/22/16 to 6/22/16	LOGGED BY : MS	CHECKED BY : DG
STANDARD : AS1726		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits								
BH	15.4	91	LL=52 Pl=35	0.70m B	64.7	0.20m	TOPSOIL: Sandy SILT (ML), organics, roots	L	VS	5 10 15 20		
					64.2	0.50m	Silty CLAY (CI): Intermediate plasticity, brown	D				
				1.30m	63.7	1.50m	Sandy CLAY (CI): Intermediate plasticity, brown, fine to medium grained sand	H				
							Silty CLAY (CH): High plasticity, grey, orange					
							Test Pit terminated at target depth. Ground water not encountered.					



<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket  <b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample PP Hand Penetrometer (UCS result) SV Hand Vane Shear (P: Peak Su, R: Residual Su)  <b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact  <b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) MD Medium Dense (25-50kPa) F Firm (50-100kPa) St Stiff (100-200kPa) VSt Very Stiff (200-250kPa) H Hard (>250kPa)
---	---	---	--

JACOBS AGS REV04 (WORKING) Log SKM TEST PIT LOG NYAH BURRA VINIFERA GEOTECH JULY 2016.GPJ <-DrawingFile> 23/08/2016 13:36

PROJECT : Nyah Burra Vinifera	JOB NO : IS135300	PAGE : 1 OF 1
POSITION : E: 720074.000, N: 6101802.000 (54 MGA94)	SURFACE ELEVATION : 64.400 (AHD)	LOCATION : Vinifera Southern
EQUIPMENT TYPE : Backhoe (Cat 432D)	CONTRACTOR : Coburns Earthworks	BUCKET WIDTH : 0.4m
DATE EXCAVATED : 6/22/16 to 6/22/16	LOGGED BY : MS	CHECKED BY : DG
STANDARD : AS1726		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
↑ BH ↓								TOPSOIL: Sandy SILT (ML), organics, roots					
					0.50m B	63.9 - 0.5	0.20m Silty CLAY (CI): Intermediate plasticity, grey		L St				
					1.50m	62.9 - 1.5	1.70m Test Pit terminated at target depth. Ground water not encountered.		VSt				



JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG NYAH BURRA VINIFERA GEOTECH JULY 2016.GPJ <-DrawingFile> 23/08/2016 13:36

<b>EXCAVATION</b> N Natural/Existing cutting B Bulldozer E Excavator R Ripper BH Backhoe Bucket		<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample U Undisturbed Tube Sample D Small Disturbed Sample W Water Sample ES Env Soil Sample EW Env Water Sample PP Hand Penetrometer (UCS result) SV Hand Vane Shear (P: Peak Su, R: Residual Su)		<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact		<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)	
<b>GROUNDWATER SYMBOLS</b> ▽ = Water level (static) ▽ = Water level (during drilling) ▲ = Water inflow ◀ = Water outflow		<b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet			



PROJECT : Nyah Burra Vinifera	JOB NO : IS135300	PAGE : 1 OF 1
POSITION : E: 720145.000, N: 6102009.000 (54 MGA94)	SURFACE ELEVATION : 64.200 (AHD)	LOCATION : Vinifera Southern
EQUIPMENT TYPE : Backhoe (Cat 432D)	CONTRACTOR : Coburns Earthworks	BUCKET WIDTH : 0.4m
DATE EXCAVATED : 6/22/16 to 6/22/16	LOGGED BY : MS	CHECKED BY : DG
STANDARD : AS1726		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
BH								TOPSOIL: Sandy SILT (ML), organics, roots					
						0.20m		Silty CLAY (CI): Intermediate plasticity, grey					
						0.50m B		Roots observed to 700mm depth					
						1.50m		Test Pit terminated at target depth. Ground water not encountered.					



JACOBS AGS REV04 (WORKING) GJB Log SKM TEST PIT LOG NYAH BURRA VINIFERA GEOTECH JULY 2016.GPJ <-DrawingFile> 23/08/2016 13:36

<p><b>EXCAVATION</b></p> <p>N Natural/Existing cutting E Excavator BH Backhoe Bucket</p> <p>B Bulldozer R Ripper</p> <p><b>GROUNDWATER SYMBOLS</b></p> <p>▼ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow</p>	<p><b>SAMPLES &amp; FIELD TESTS</b></p> <p>B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample</p> <p>U Undisturbed Tube Sample W Water Sample</p> <p>PP Hand Penetrometer (UCS result) SV Hand Vane Shear (P: Peak Su, R: Residual Su)</p> <p><b>PHOTOGRAPHS NOTES</b></p> <p><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>	<p><b>DENSITY</b></p> <p>VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact</p> <p><b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet</p>	<p><b>CONSISTENCY (Su)</b></p> <p>VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) MD Medium Dense (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (&gt;200kPa)</p>
---	--	--	--



PROJECT : Nyah Burra Vinifera	JOB NO : IS135300	PAGE : 1 OF 1
POSITION : E: 720267.000, N: 6102068.000 (54 MGA94)	SURFACE ELEVATION : 64.000 (AHD)	LOCATION : Vinifera Southern
EQUIPMENT TYPE : Backhoe (Cat 432D)	CONTRACTOR : Coburns Earthworks	BUCKET WIDTH : 0.4m
DATE EXCAVATED : 6/22/16 to 6/22/16	LOGGED BY : MS	CHECKED BY : DG
STANDARD : AS1726		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
BH								TOPSOIL: Clayey SILT (ML), organics, roots	M	SL			
					0.50m B	63.5 - 0.5	0.40m	Silty CLAY (CI): Intermediate plasticity, brown, grey					
					1.50m	62.5 - 1.5	1.50m	Test Pit terminated at target depth. Ground water not encountered.					



JACOBS AGS REV04 (WORKING) GJB Log SKM TEST PIT LOG NYAH BURRA VINIFERA GEOTECH JULY 2016.GPJ <-DrawingFile> 23/08/2016 13:36

<p><b>EXCAVATION</b></p> <p>N Natural/Existing cutting B Bulldozer          E Excavator R Ripper          BH Backhoe Bucket</p> <p><b>GROUNDWATER SYMBOLS</b></p> <p>▼ = Water level (static)          ▽ = Water level (during drilling)          ► = Water inflow          ◄ = Water outflow</p>	<p><b>SAMPLES &amp; FIELD TESTS</b></p> <p>B Bulk Sample U Undisturbed Tube Sample          D Small Disturbed Sample W Water Sample          ES Env Soil Sample          EW Env Water Sample          PP Hand Penetrometer (UCS result)          SV Hand Vane Shear (P: Peak Su, R: Residual Su)</p> <p><b>PHOTOGRAPHS NOTES</b></p> <p><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>	<p><b>DENSITY</b></p> <p>VL Very Loose          L Loose          MD Medium Dense          D Dense          VD Very Dense          CO Compact</p> <p><b>MOISTURE CONDITION</b>          D = Dry M = Moist W = Wet</p>	<p><b>CONSISTENCY (Su)</b></p> <p>VS Very Soft (0-12.5kPa)          S Soft (12.5-25kPa)          MD Medium Dense (25-50kPa)          F Firm (50-100kPa)          St Stiff (100-200kPa)          VSt Very Stiff (200-250kPa)          H Hard (&gt;250kPa)</p>
---	---	--	--

PROJECT : Nyah Burra Vinifera	JOB NO : IS135300	PAGE : 1 OF 1
POSITION : E: 720476.000, N: 6102295.000 (54 MGA94)	SURFACE ELEVATION : 64.200 (AHD)	LOCATION : Vinifera Southern
EQUIPMENT TYPE : Backhoe (Cat 432D)	CONTRACTOR : Coburns Earthworks	BUCKET WIDTH : 0.4m
DATE EXCAVATED : 6/22/16 to 6/22/16	LOGGED BY : MS	CHECKED BY : DG
STANDARD : AS1726		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
BH								TOPSOIL: Silty CLAY (CI), organics, roots		S			
						63.7	0.5	Silty CLAY (CI): Intermediate plasticity, brown, grey		St			
						62.7	1.5	becoming orange, grey, light brown		VSt			
							1.70m	Test Pit terminated at target depth. Ground water not encountered.		H			



JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG NYAH BURRA VINIFERA GEOTECH JULY 2016.GPJ <-DrawingFile> 23/08/2016 13:36

<p><b>EXCAVATION</b></p> <p>N Natural/Existing cutting B Bulldozer          E Excavator R Ripper          BH Backhoe Bucket</p> <p><b>GROUNDWATER SYMBOLS</b></p> <p>▼ = Water level (static)          ▽ = Water level (during drilling)          ► = Water inflow          ◄ = Water outflow</p>	<p><b>SAMPLES &amp; FIELD TESTS</b></p> <p>B Bulk Sample U Undisturbed Tube Sample          D Small Disturbed Sample W Water Sample          ES Env Soil Sample          EW Env Water Sample          PP Hand Penetrometer (UCS result)          SV Hand Vane Shear (P: Peak Su, R: Residual Su)</p> <p><b>PHOTOGRAPHS NOTES</b></p> <p><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>	<p><b>DENSITY</b></p> <p>VL Very Loose          L Loose          MD Medium Dense          D Dense          VD Very Dense          CO Compact</p> <p><b>MOISTURE CONDITION</b>          D = Dry M = Moist W = Wet</p>	<p><b>CONSISTENCY (Su)</b></p> <p>VS Very Soft (0-12.5kPa)          S Soft (12.5-25kPa)          MD Medium Dense (25-50kPa)          St Stiff (50-100kPa)          VSt Very Stiff (100-200kPa)          H Hard (&gt;200kPa)</p>
---	---	--	---



PROJECT : Nyah Burra Vinifera	JOB NO : IS135300	PAGE : 1 OF 1
POSITION : E: 720474.000, N: 6102501.000 (54 MGA94)	SURFACE ELEVATION : 62.700 (AHD)	LOCATION : Vinifera Southern
EQUIPMENT TYPE : Backhoe (Cat 432D)	CONTRACTOR : Coburns Earthworks	BUCKET WIDTH : 0.4m
DATE EXCAVATED : 6/22/16 to 6/22/16	LOGGED BY : MS	CHECKED BY : DG
STANDARD : AS1726		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits									
BH	18	94	LL=50 Pl=38	0.40m B	62.2	0.40m	[Hatched Box]	TOPSOIL: Silty CLAY (CI), organics, roots	M	S	5		
				0.60m B	62.2-0.5	0.40m		Silty CLAY (CI): Intermediate plasticity, brown, with fine grained sand  Becoming orange, grey	VSt	10			
				1.50m B	61.7-1.0	1.50m		D to M	H	15			
					61.2	1.5		Test Pit terminated at target depth. Ground water not encountered.			20		



JACOBS AGS REV04 (WORKING).GLB Log SKM TEST PIT LOG NYAH BURRA VINIFERA GEOTECH JULY 2016.GPJ <-DrawingFile> 23/08/2016 13:36

<b>EXCAVATION</b> N Natural/Existing cutting E Excavator BH Backhoe Bucket  <b>GROUNDWATER SYMBOLS</b> = Water level (static) = Water level (during drilling) = Water inflow = Water outflow	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample PP Hand Penetrometer (UCS result) SV Hand Vane Shear (P: Peak Su, R: Residual Su)  <b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact  <b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) MD Medium Dense (25-50kPa) F Firm (50-100kPa) St Stiff (100-200kPa) VSt Very Stiff (>200kPa) H Hard (>200kPa)
---	---	---	---



PROJECT : Nyah Burra Vinifera	JOB NO : IS135300	PAGE : 1 OF 1
POSITION : E: 720450.000, N: 6102694.000 (54 MGA94)	SURFACE ELEVATION : 64.300 (AHD)	LOCATION : Vinifera Southern
EQUIPMENT TYPE : Backhoe (Cat 432D)	CONTRACTOR : Coburns Earthworks	BUCKET WIDTH : 0.4m
DATE EXCAVATED : 6/22/16 to 6/22/16	LOGGED BY : MS	CHECKED BY : DG
STANDARD : AS1726		

EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits								
BH						0.1m	TOPSOIL: Clayey SILT (ML) organics, roots	St		5		
						63.8-0.5	Silty CLAY (CI): Intermediate plasticity, brown, orange, grey, with fine grained sand	VSt		10		
						63.3-1.0				15		
						62.8-1.5				20		
						1.60m	Test Pit terminated at target depth. Ground water not encountered.					



JACOBS AGS REV04 (WORKING) GJB Log SKM TEST PIT LOG NYAH BURRA VINIFERA GEOTECH JULY 2016.GPJ <-DrawingFile> 23/08/2016 13:36

<p><b>EXCAVATION</b></p> <p>N Natural/Existing cutting E Excavator BH Backhoe Bucket</p> <p>B Bulldozer R Ripper</p> <p><b>GROUNDWATER SYMBOLS</b></p> <p>▼ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow</p>	<p><b>SAMPLES &amp; FIELD TESTS</b></p> <p>B Bulk Sample D Small Disturbed Sample ES Env Soil Sample EW Env Water Sample</p> <p>U Undisturbed Tube Sample W Water Sample</p> <p>PP Hand Penetrometer (UCS result) SV Hand Vane Shear (P: Peak Su, R: Residual Su)</p> <p><b>PHOTOGRAPHS NOTES</b></p> <p><input type="checkbox"/> YES <input checked="" type="checkbox"/> NO</p>	<p><b>DENSITY</b></p> <p>VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact</p> <p><b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet</p>	<p><b>CONSISTENCY (Su)</b></p> <p>VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (&gt;200kPa)</p>
---	--	--	---

PROJECT : Nyah Burra Vinifera	JOB NO : IS135300	PAGE : 1 OF 1
POSITION : E: 720372.000, N: 6102800.000 (54 MGA94)	SURFACE ELEVATION : 64.000 (AHD)	LOCATION : Vinifera Southern
EQUIPMENT TYPE : Backhoe (Cat 432D)	CONTRACTOR : Coburns Earthworks	BUCKET WIDTH : 0.4m
DATE EXCAVATED : 6/22/16 to 6/22/16	LOGGED BY : MS	CHECKED BY : DG
STANDARD : AS1726		

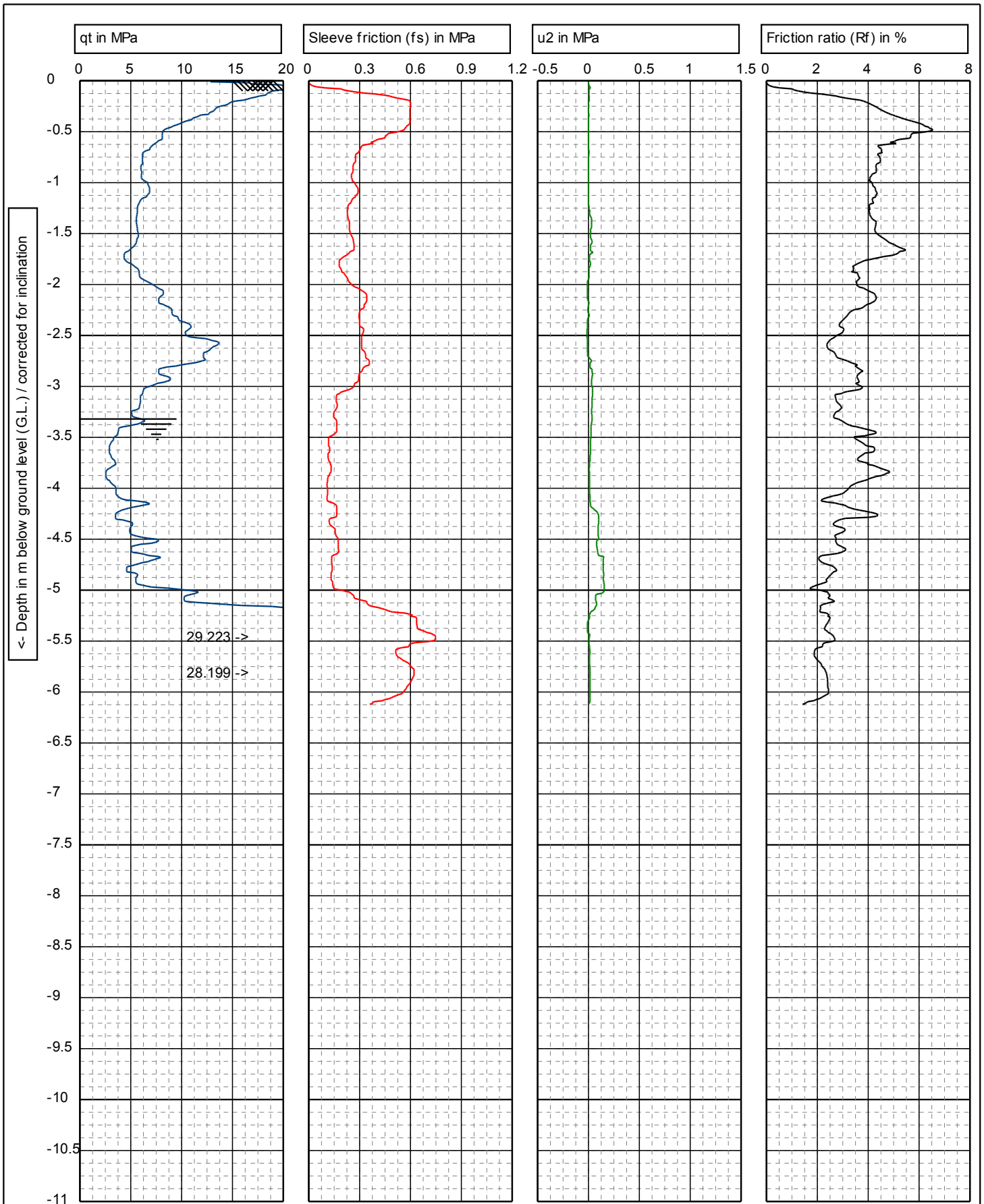
EXCAVATION & WATER DETAIL	LAB DATA				SAMPLES & FIELD DATA	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE	CONSISTENCY/DENSITY	DCP (blows/100mm)	COMMENTS Field Test Data & Other Observations
	Moisture Content	Dry Density	% Fines	Atterberg Limits								
BH					RL (m)		TOPSOIL: Clayey SILT (ML) organics, roots	St				
					63.5	0.20m	Silty CLAY (CI): Intermediate plasticity, brown, with fine grained sand	VSt				
					63.0	0.50m B	Roots observed to 750mm depth	M				0.70: DCP Refusal at 0.7m
					62.5	1.10m B	DCP Refusal	St				
					62.5	1.40m	Becoming grey, blue					
							Test Pit terminated at target depth. Ground water not encountered.					



<b>EXCAVATION</b> N Natural/Existing cutting B Bulldozer E Excavator R Ripper BH Backhoe Bucket	<b>SAMPLES &amp; FIELD TESTS</b> B Bulk Sample U Undisturbed Tube Sample D Small Disturbed Sample W Water Sample ES Env Soil Sample EW Env Water Sample PP Hand Penetrometer (UCS result) SV Hand Vane Shear (P: Peak Su, R: Residual Su)	<b>DENSITY</b> VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense CO Compact	<b>CONSISTENCY (Su)</b> VS Very Soft (0-12.5kPa) S Soft (12.5-25kPa) F Firm (25-50kPa) St Stiff (50-100kPa) VSt Very Stiff (100-200kPa) H Hard (>200kPa)
<b>GROUNDWATER SYMBOLS</b> ▽ = Water level (static) ▽ = Water level (during drilling) ▶ = Water inflow ◀ = Water outflow	<b>PHOTOGRAPHS NOTES</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>MOISTURE CONDITION</b> D = Dry M = Moist W = Wet	

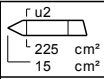
## Appendix C. CPT Results





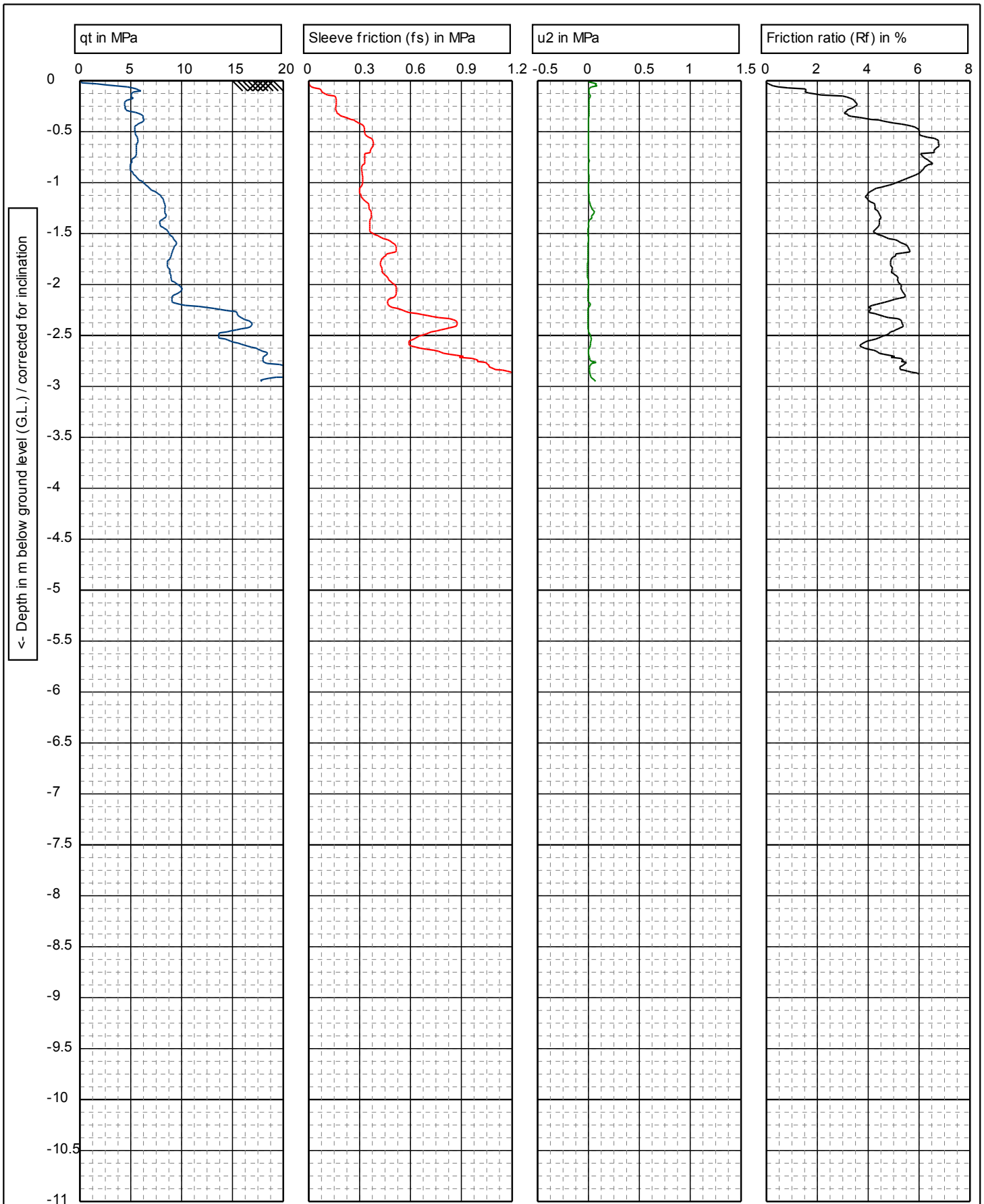
Refusal at 6.22m qc > 30 MPa

Hole open to 3.53m



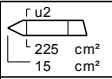
Client : Jacobs		Predrill : <b>0 m Predrilled</b>	
G.L. 0	W.L.: -3.32	Date:	<b>28/10/2014</b>
Project: <b>CMA-SDL Works</b>		Cone no.:	<b>S15CFIP.S12299</b>
Location: <b>B1</b>		Project no.:	<b>A275</b>
Position:		CPT no.:	<b>BCN-CPT01</b>   1/1

1-40



Refusal at 2.96m Lifting Truck

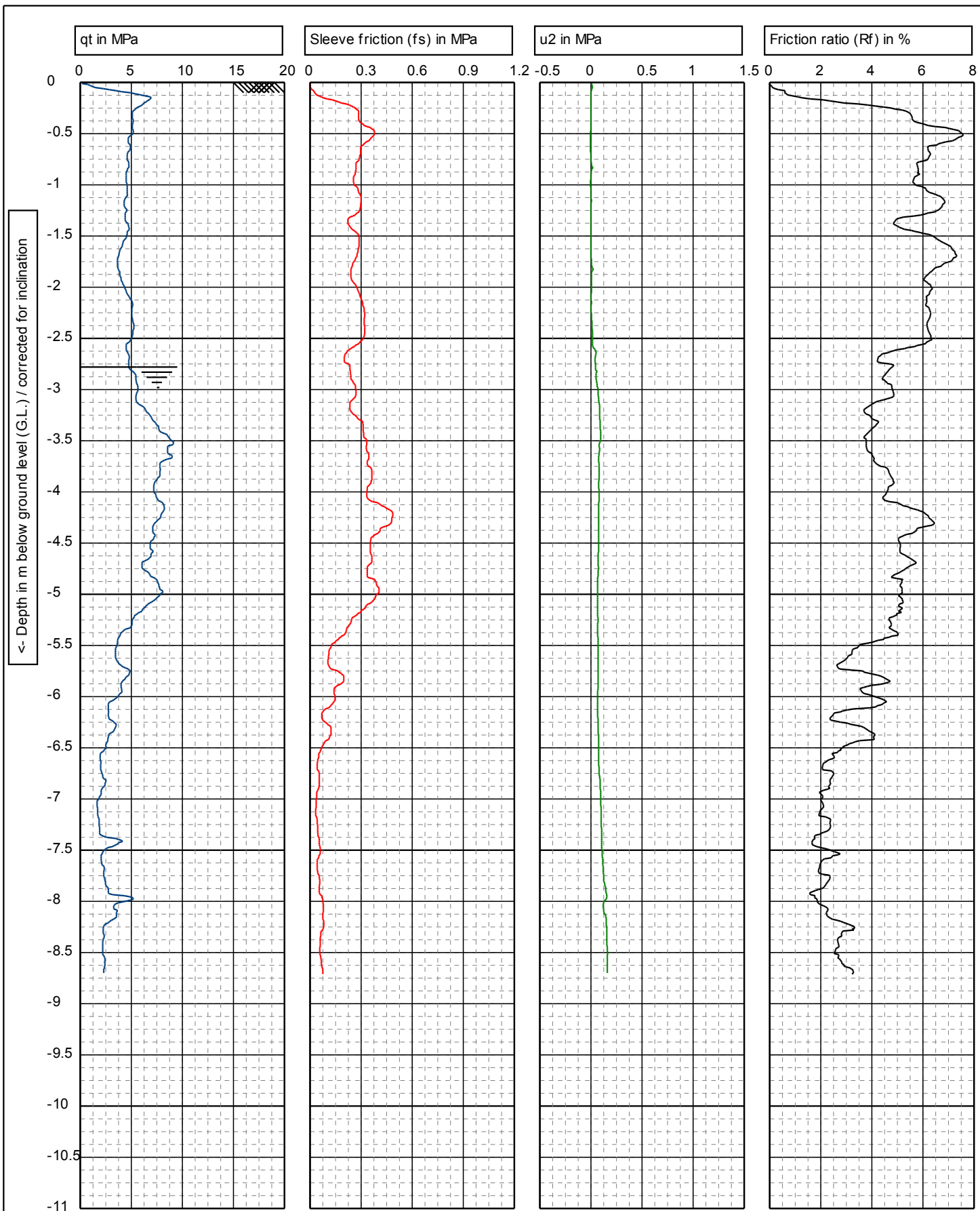
Hole open to 2.58m Dry



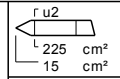
Client : Jacobs  
 G.L. 0      W.L.: 0

Predrill : **0 m Predrilled**  
 Date: **28/10/2014**  
 Cone no.: **S15CFIP.S12299**  
 Project no.: **A275**  
 CPT no.: **BCN-CPT02** | 1/1

Project: **CMA-SDL Works**  
 Location: **B1**  
 Position:

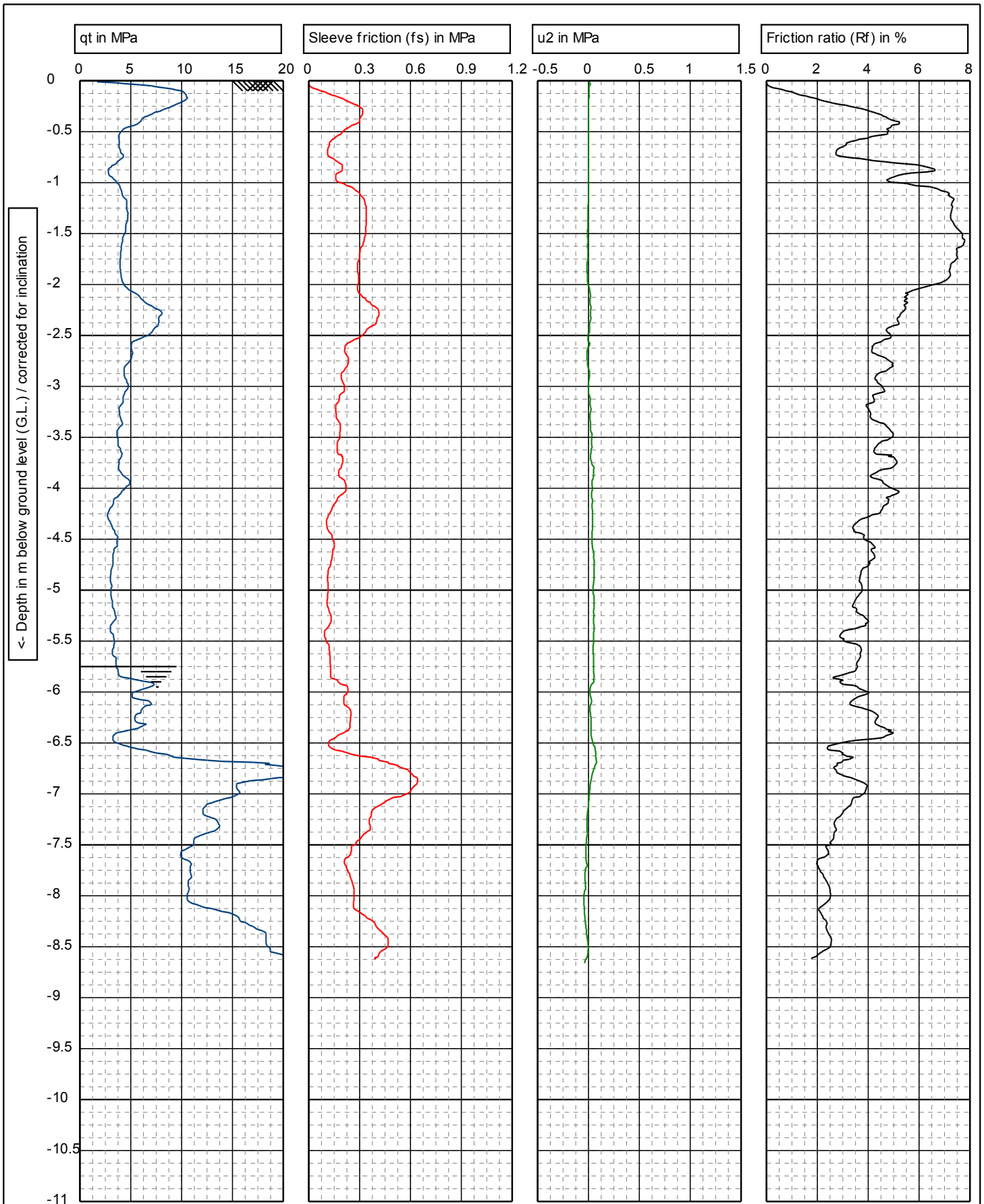


Test complete at 8.80m  
 Hole open to 7.25m



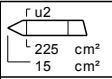
Client : Jacobs		Predrill : <b>0 m Predrilled</b>	
G.L. 0	W.L.: -2.78	Date:	<b>27/10/2014</b>
Project: <b>CMA-SDL Works</b>		Cone no.:	<b>S15CFIP.S12299</b>
Location: <b>B2</b>		Project no.:	<b>A275</b>
Position:		CPT no.:	<b>BCN-CPT03</b>   1/1



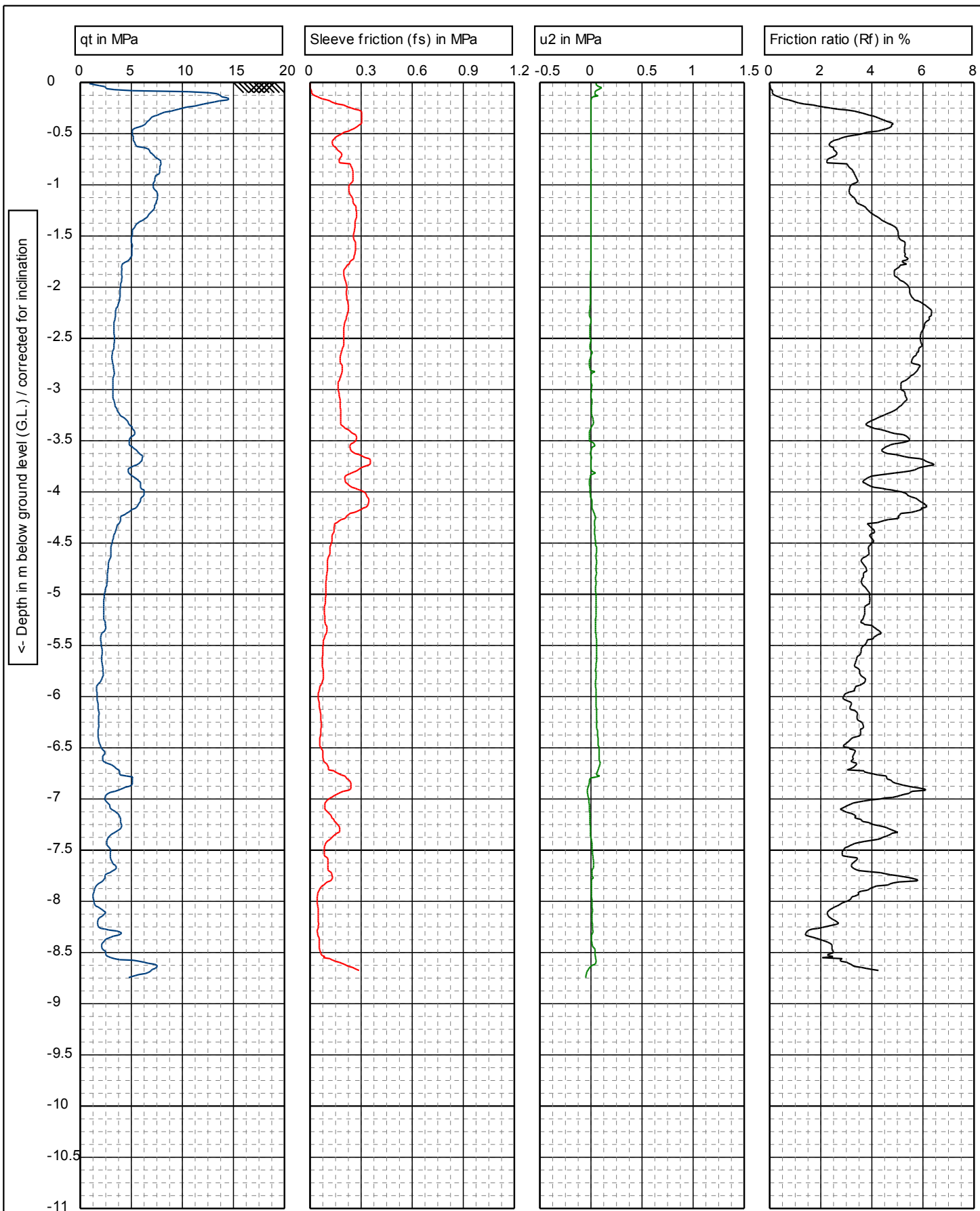


Test complete at 8.75m

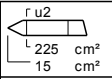
Hole open to 5.95m



Client : Jacobs		Predrill : <b>0 m Predrilled</b>
G.L. 0	W.L.: <b>-5.75</b>	Date: <b>27/10/2014</b>
Project: <b>CMA-SDL Works</b>		Cone no.: <b>S15CFIP.S12299</b>
Location: <b>B2</b>		Project no.: <b>A275</b>
Position:		CPT no.: <b>BCN-CPT04</b>   1/1

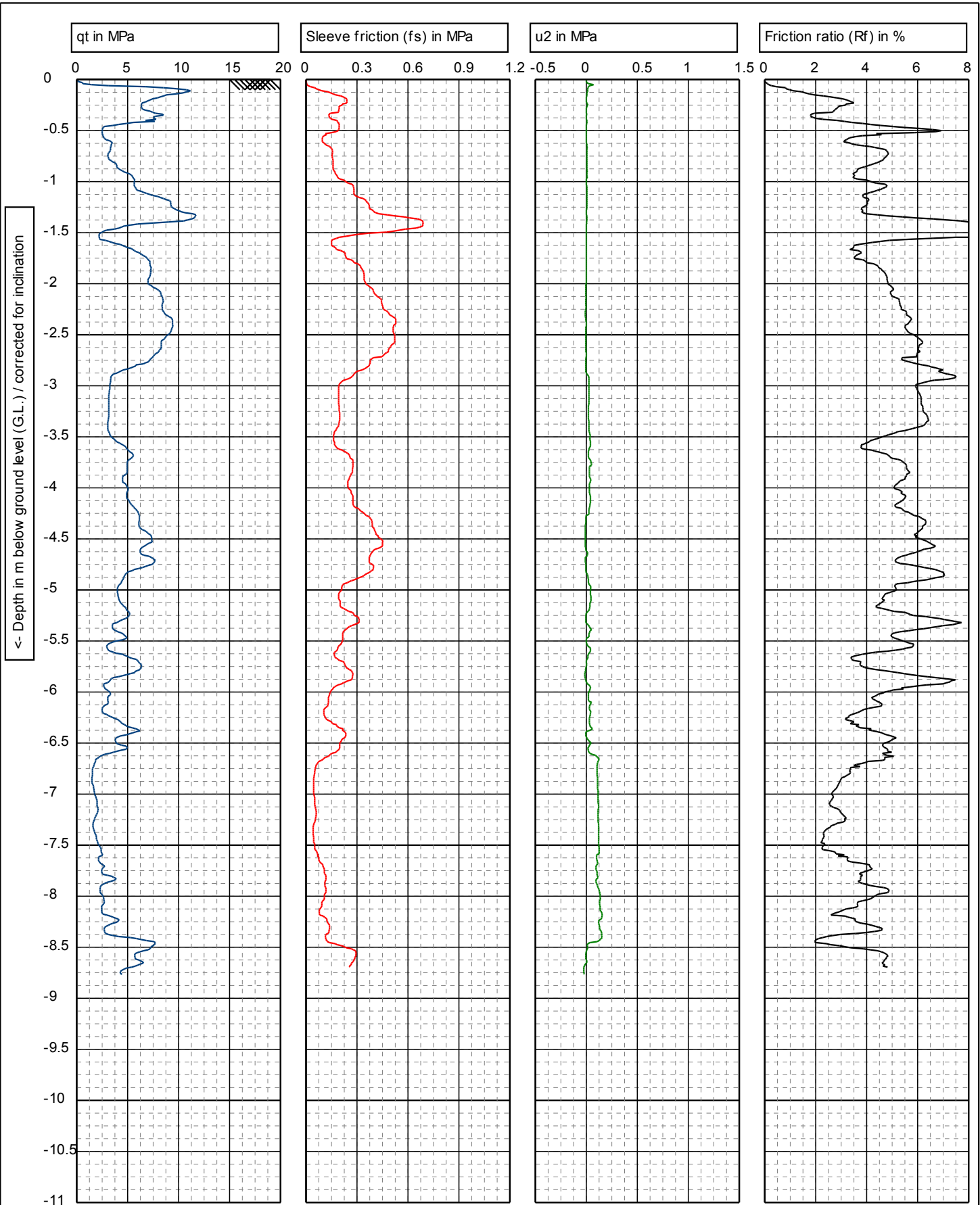


Test complete at 8.84m  
 Hole open to 7.50m Dry



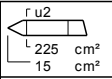
Client : Jacobs		Predrill : <b>0 m Predrilled</b>	
G.L. 0	W.L.: 0	Date:	<b>29/10/2014</b>
Project: <b>CMA-SDL Works</b>		Cone no.:	<b>S15CFIP.S12299</b>
Location: <b>B4</b>		Project no.:	<b>A275</b>
Position:		CPT no.:	<b>BCS-CPT01</b>   1/1

1-40



Test complete at 8.77m

Hole collapsed at surface

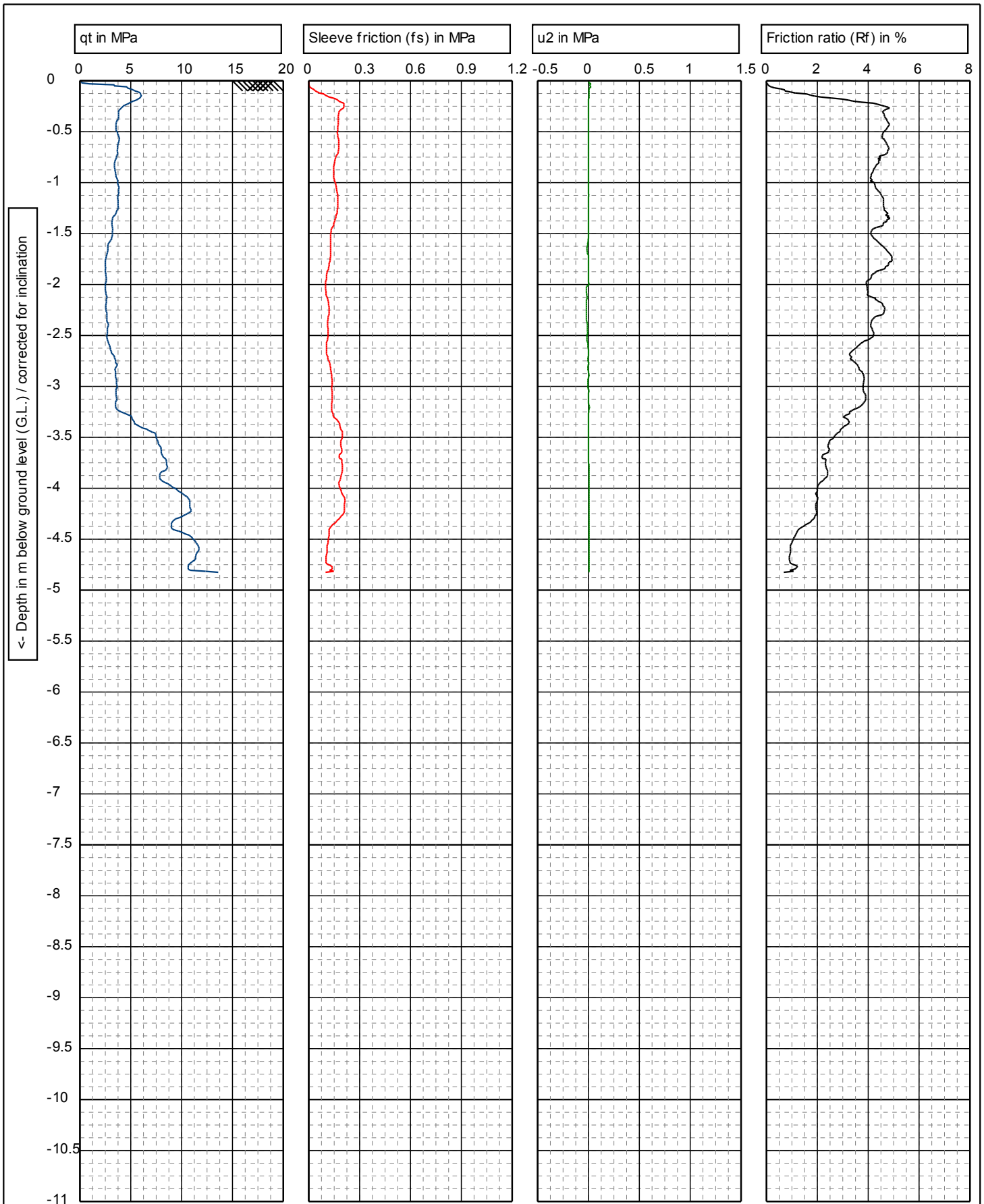


Client : Jacobs  
 G.L. 0      W.L.: 0

Predrill : **0 m Predrilled**  
 Date: **29/10/2014**  
 Cone no.: **S15CFIP.S12299**  
 Project no.: **A275**  
 CPT no.: **BCS-CPT02** | 1/1

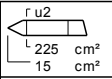
Project: **CMA-SDL Works**  
 Location: **B4**  
 Position:





← Depth in m below ground level (G.L.) / corrected for inclination

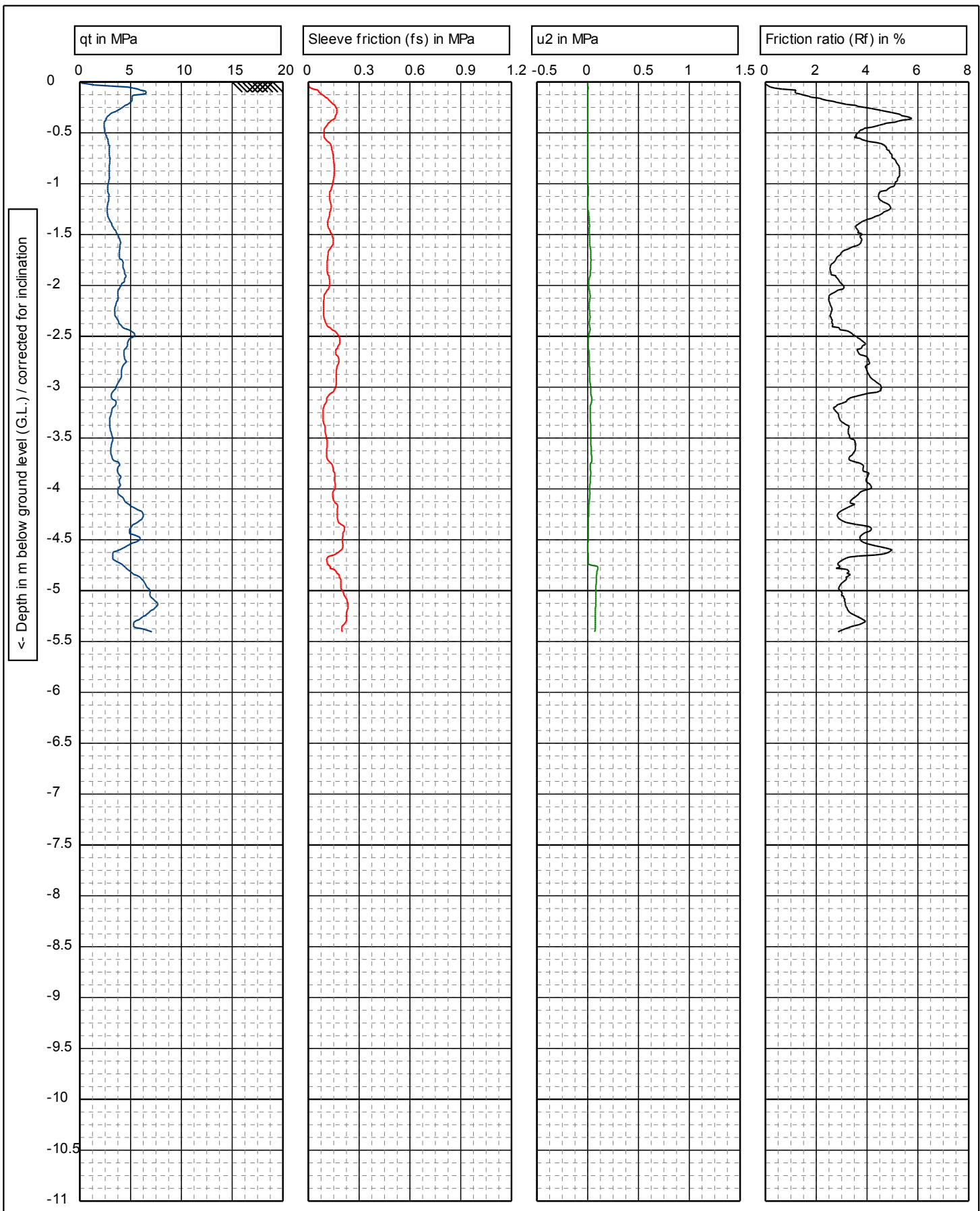
Refusal at 4.92m Inclination  
 Hole open to 4.77m Dry



Client : Jacobs  
 G.L. 0      W.L.: 0

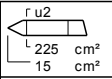
Predrill : **0 m Predrilled**  
 Date: **29/10/2014**  
 Cone no.: **S15CFIP.S12299**  
 Project no.: **A275**  
 CPT no.: **NN-CPT01A** | 1/1

Project: **CMA-SDL Works**  
 Location: **N1a**  
 Position:



Test complete at 5.50m

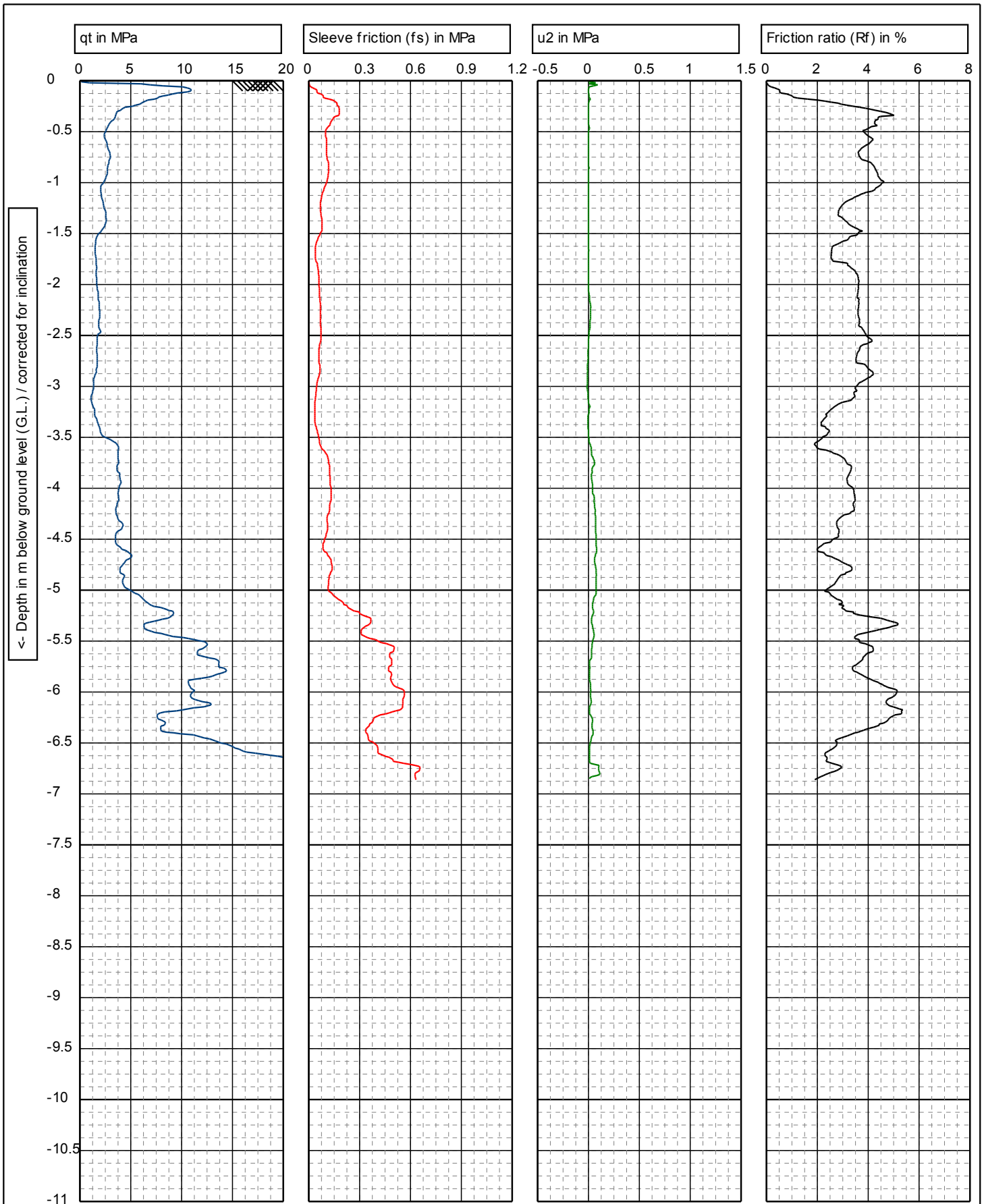
Hole open to 5.19m Dry



Client : Jacobs  
 G.L. 0      W.L.: 0

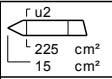
Predrill : **0 m Predrilled**  
 Date: **29/10/2014**  
 Cone no.: **S15CFIP.S12299**  
 Project no.: **A275**  
 CPT no.: **NN-CPT02A** | 1/1

Project: **CMA-SDL Works**  
 Location: **N1b**  
 Position:



Refusal at 6.95m qc > 40 MPa

Hole open to 6.54m Dry



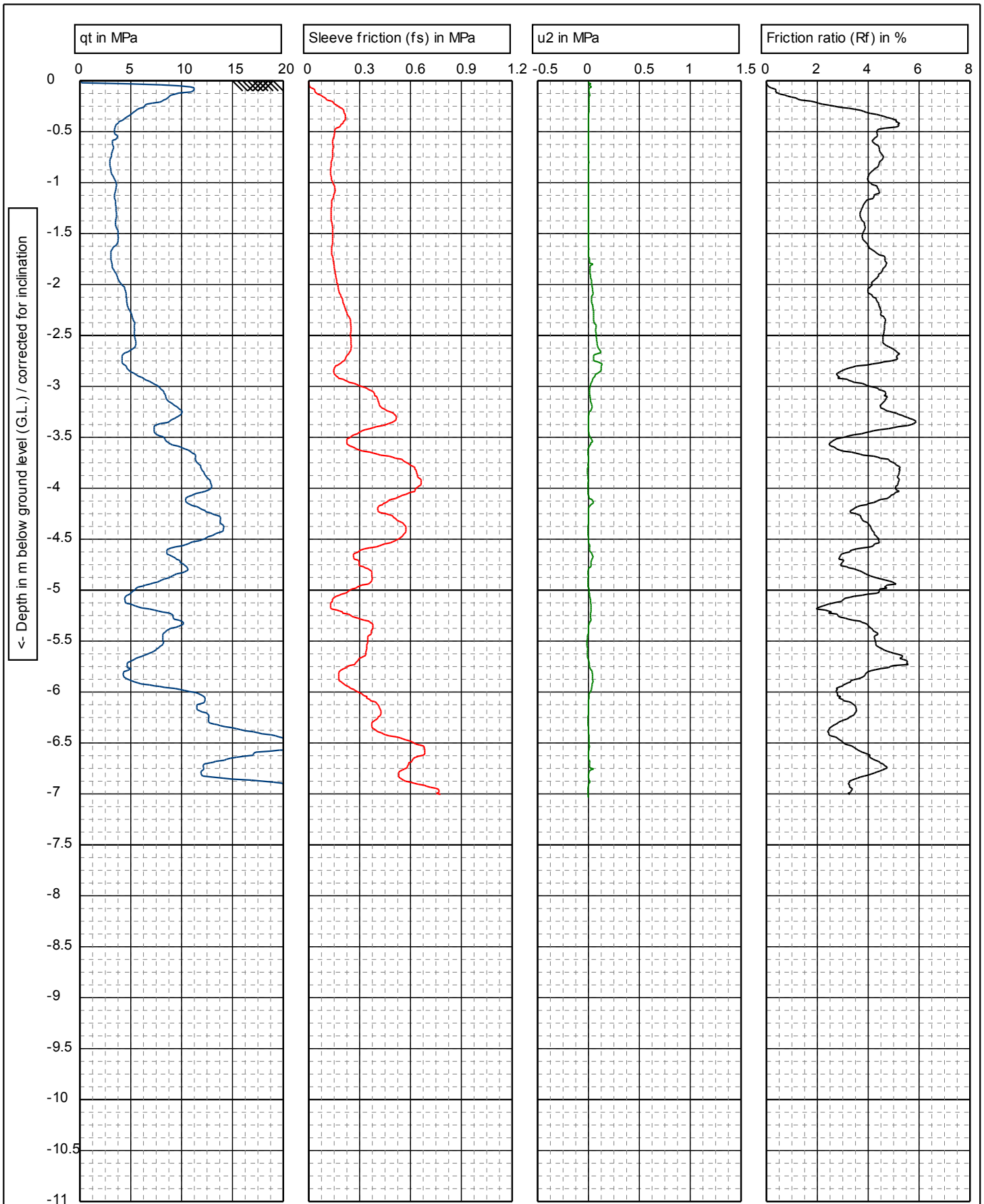
Client : Jacobs  
 G.L. 0      W.L.: 0

Predrill : **0 m Predrilled**  
 Date: **28/10/2014**  
 Cone no.: **S15CFIP.S12299**  
 Project no.: **A275**  
 CPT no.: **NN-CPT03** | 1/1

Project: **CMA-SDL Works**  
 Location: **N2**  
 Position:

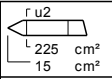
1-40





Refusal at 7.13m Lifting Truck

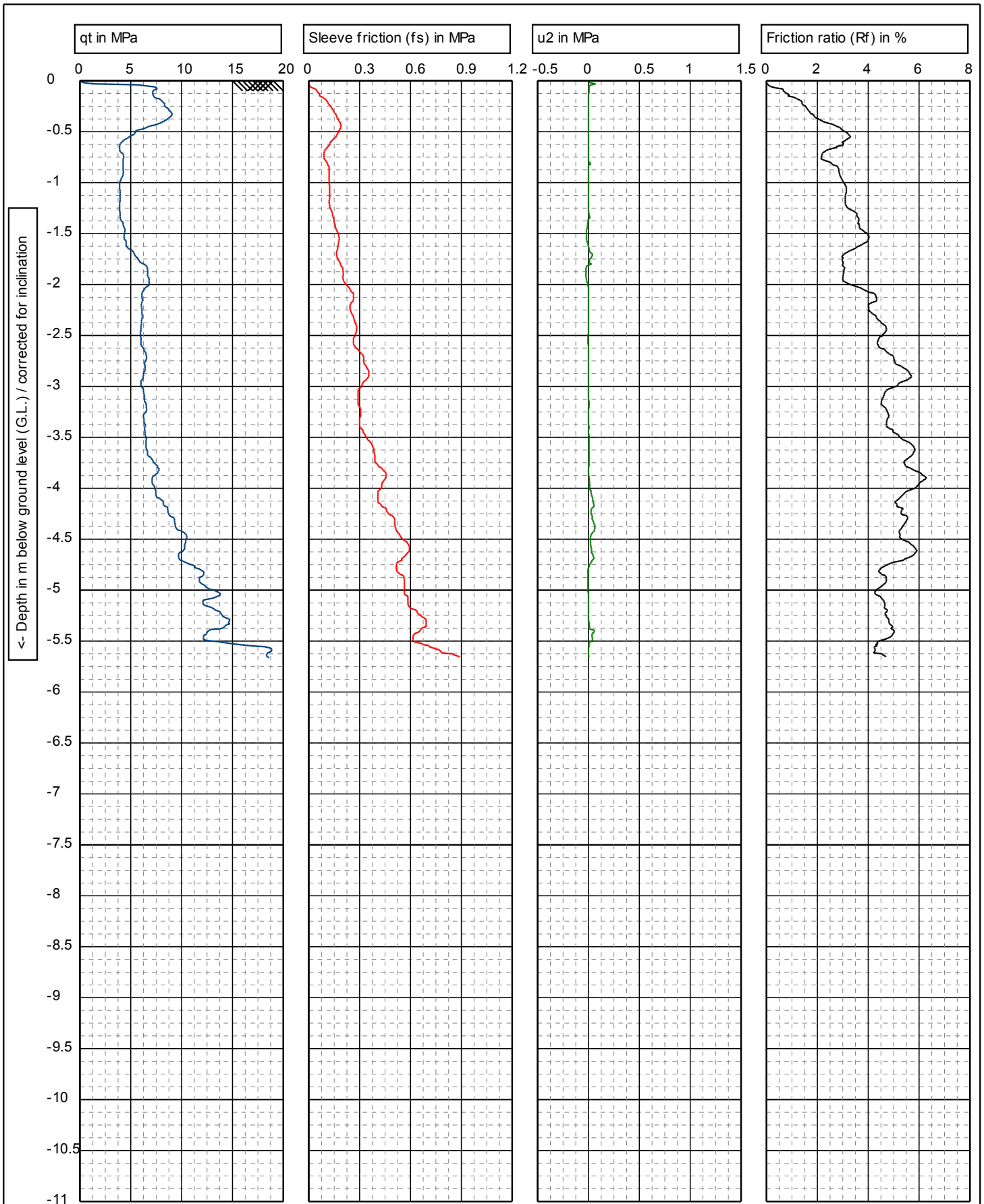
Hole open to 6.83m Dry



Client : Jacobs  
 G.L. 0      W.L.: 0

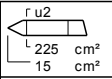
Predrill : **0 m Predrilled**  
 Date: **28/10/2014**  
 Cone no.: **S15CFIP.S12299**  
 Project no.: **A275**  
 CPT no.: **NN-CPT04** | 1/1

Project: **CMA-SDL Works**  
 Location: **N2**  
 Position:

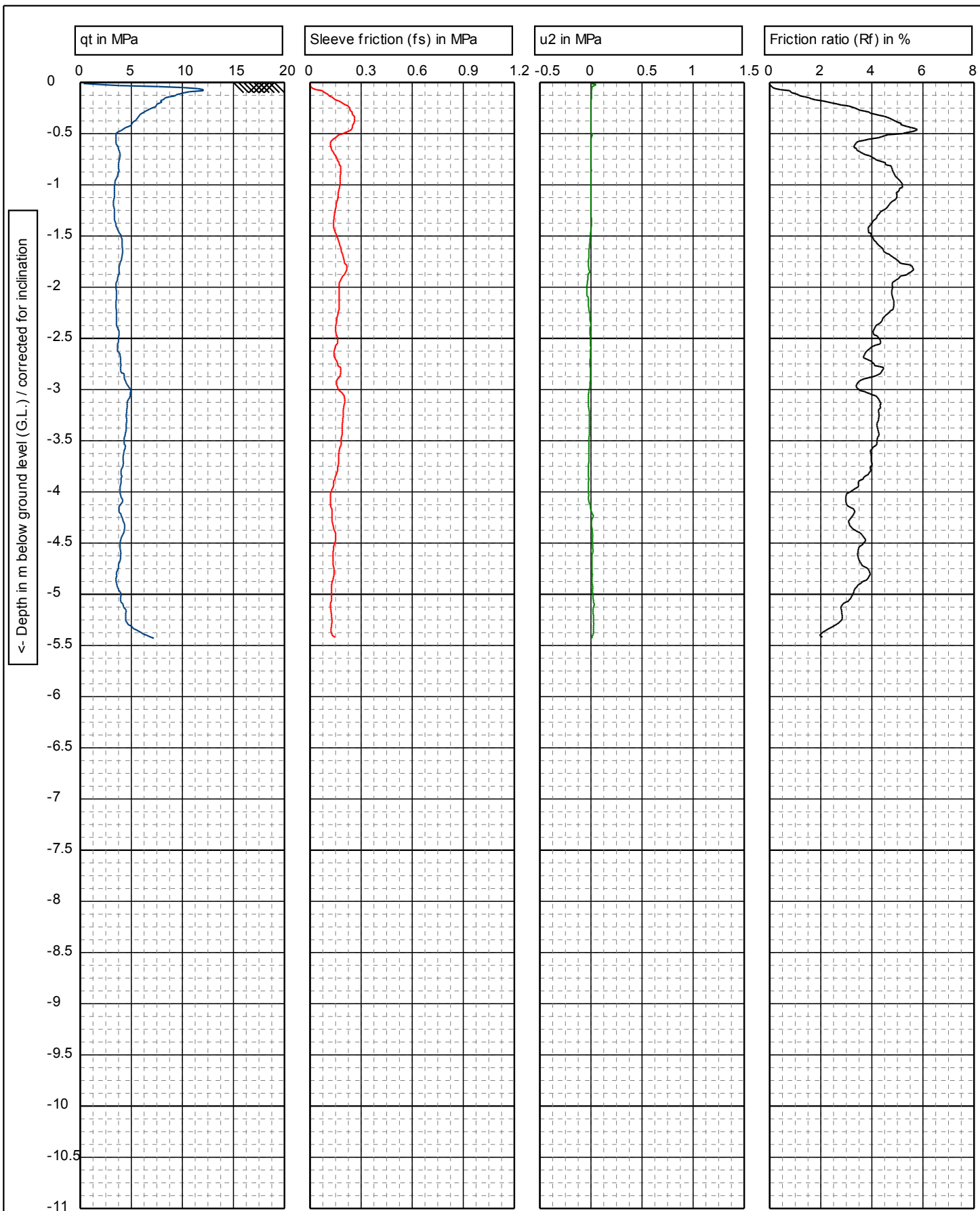


Depth in m below ground level (G.L.) / corrected for inclination

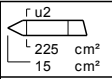
Refusal at 5.76m Lifting Truck  
 Hole open to 5.61m Dry



Client : Jacobs		Predrill : <b>0 m Predrilled</b>	
G.L. 0	W.L.: 0	Date:	<b>28/10/2014</b>
Project: <b>CMA-SDL Works</b>		Cone no.:	<b>S15CFIP.S12299</b>
Location: <b>N5</b>		Project no.:	<b>A275</b>
Position:		CPT no.:	<b>NS-CPT01</b>   1/1



Test complete at 5.52m  
 Hole open to 5.25m Dry

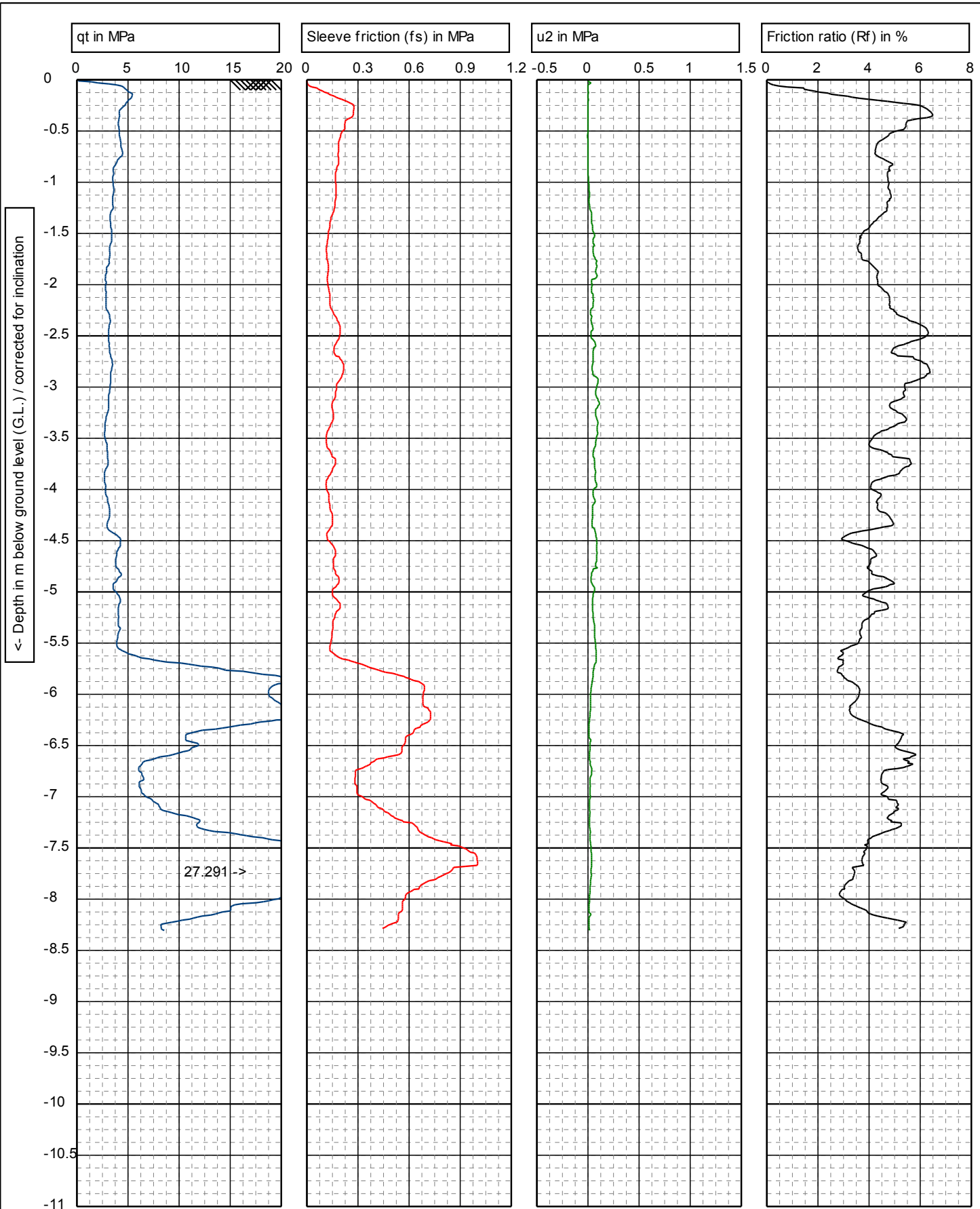


Client : Jacobs  
 G.L. 0      W.L.: 0

Predrill : **0 m Predrilled**  
 Date: **28/10/2014**  
 Cone no.: **S15CFIP.S12299**  
 Project no.: **A275**  
 CPT no.: **VN-CPT01** | 1/1

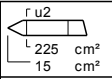
Project: **CMA-SDL Works**  
 Location: **V1**  
 Position:





Test complete at 8.40m

Hole open to 7.95m Dry

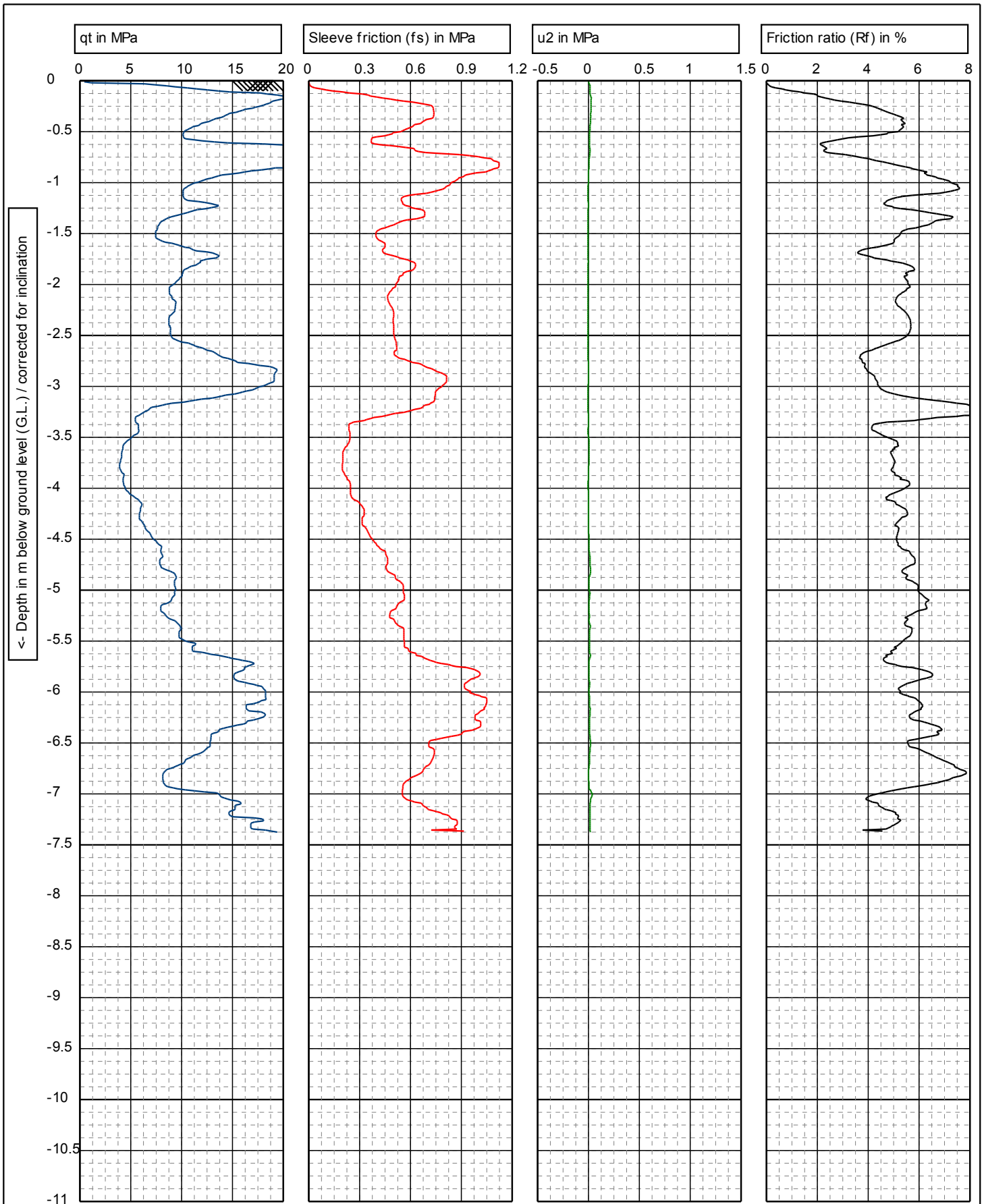


Client : Jacobs  
 G.L. 0      W.L.: 0

Predrill : **0 m Predrilled**  
 Date: **28/10/2014**  
 Cone no.: **S15CFIP.S12299**  
 Project no.: **A275**  
 CPT no.: **VN-CPT02** | 1/1

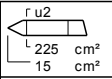
Project: **CMA-SDL Works**  
 Location: **V2**  
 Position:

1-40



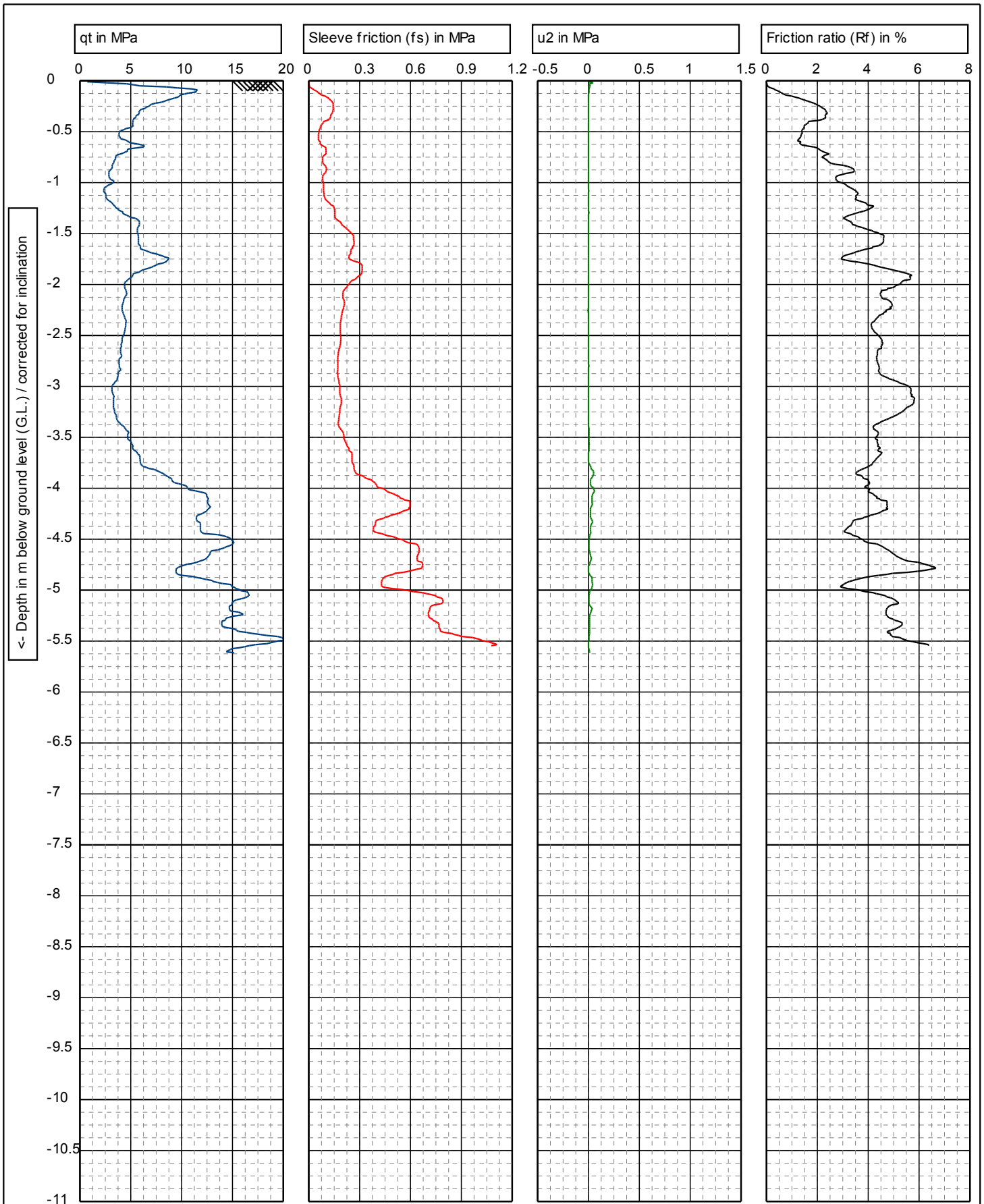
Depth in m below ground level (G.L.) / corrected for inclination

Refusal at 7.47m Lifting Truck  
 Hole open to 7.28m Dry



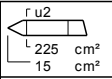
Client : Jacobs  
 G.L. 0      W.L.: 0  
 Project: **CMA-SDL Works**  
 Location: **V3**  
 Position:

Predrill : **0 m Predrilled**  
 Date: **28/10/2014**  
 Cone no.: **S15CFIP.S12299**  
 Project no.: **A275**  
 CPT no.: **VS-CPT01** | 1/1



Refusal at 5.61m Lifting Truck

Hole open to 5.38m Dry

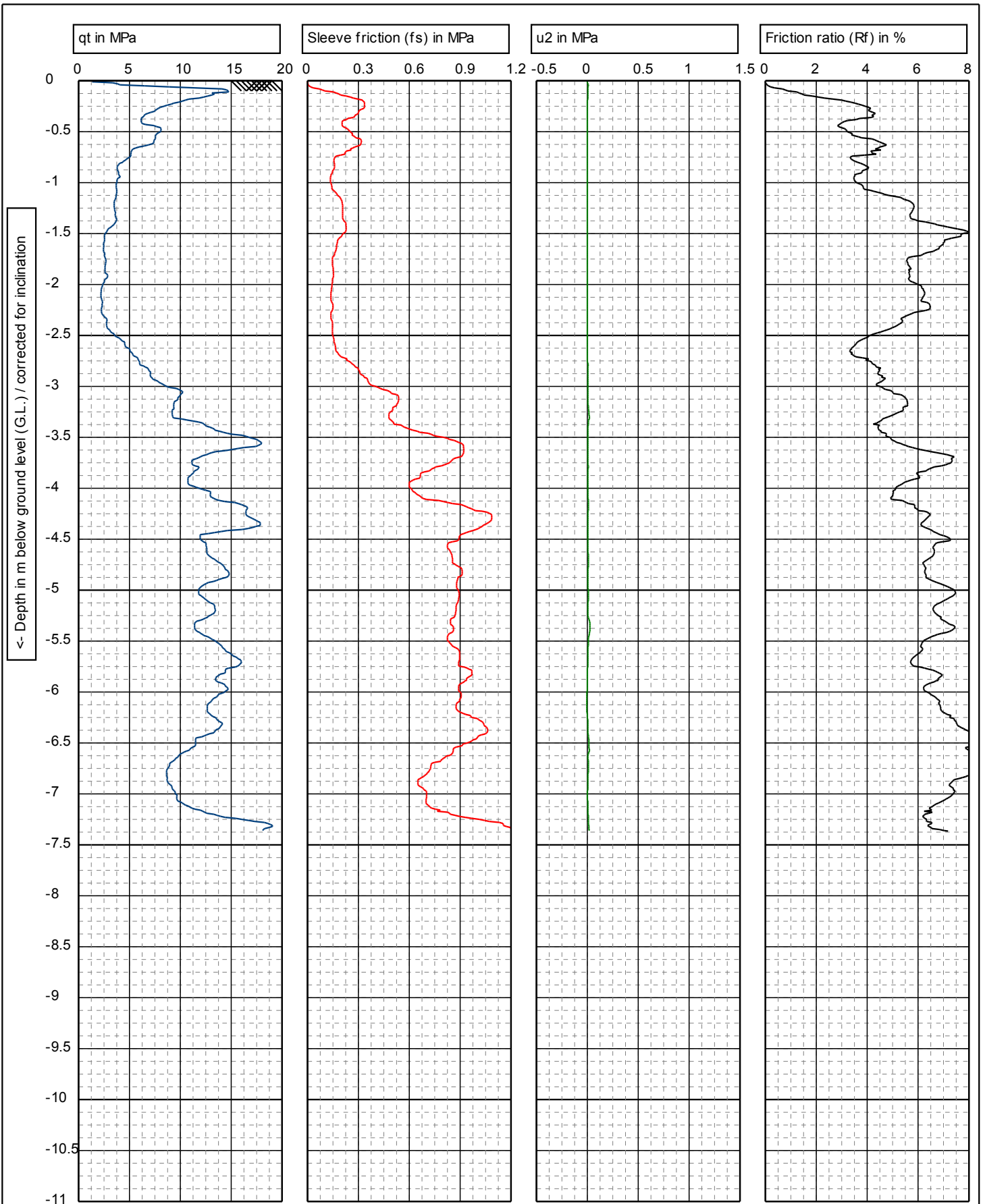


Client : Jacobs  
 G.L. 0      W.L.: 0

Predrill : **0 m Predrilled**  
 Date: **28/10/2014**  
 Cone no.: **S15CFIP.S12299**  
 Project no.: **A275**  
 CPT no.: **VS-CPT02** | 1/1

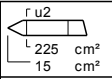
Project: **CMA-SDL Works**  
 Location: **V3**  
 Position:





Refusal at 7.45m fs > 1.3 MPa

Hole open to 7.26m Dry



Client : Jacobs

G.L. 0      W.L.: 0

Project: **CMA-SDL Works**

Location: **V3**

Position:

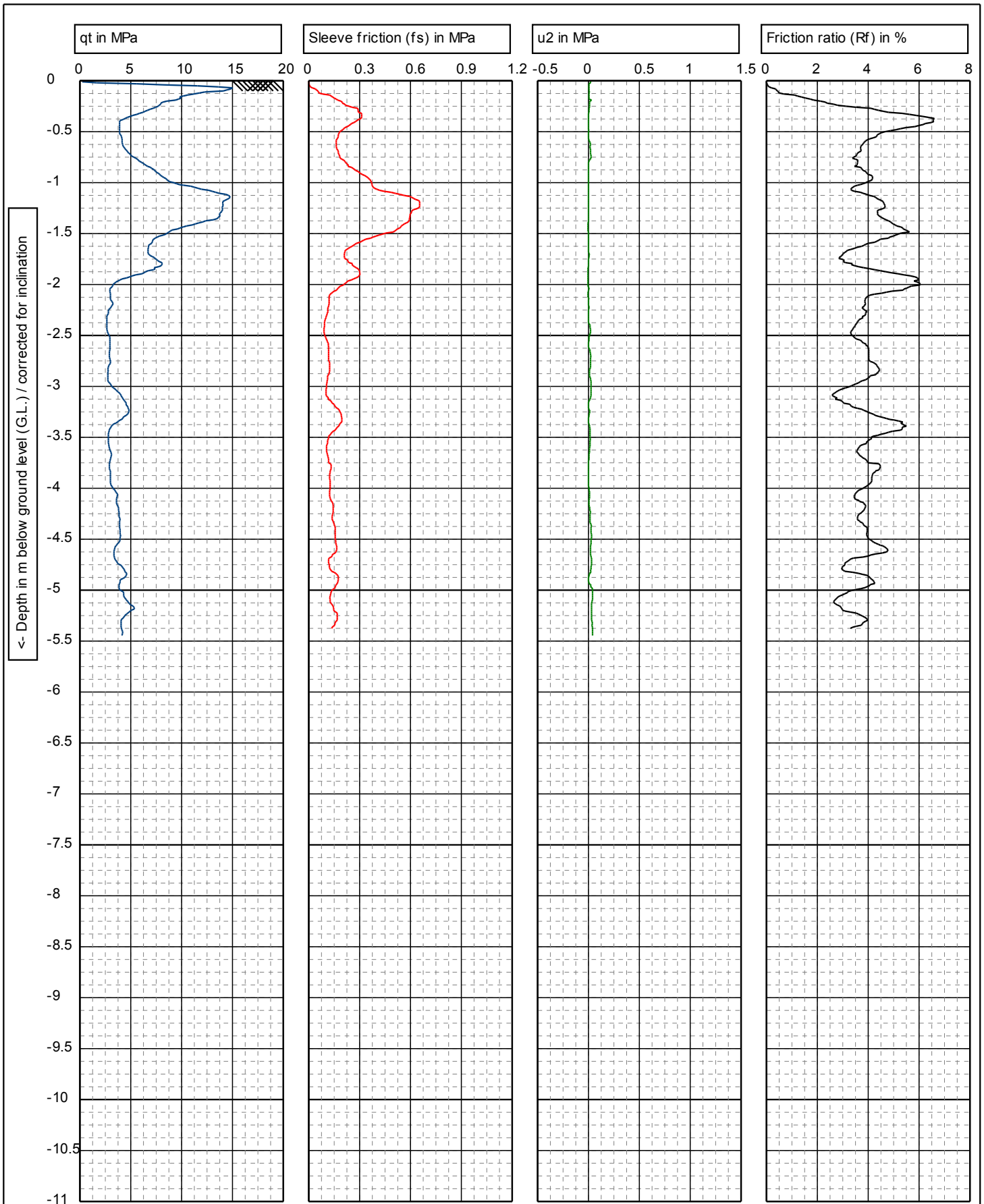
Predrill : **0 m Predrilled**

Date: **28/10/2014**

Cone no.: **S15CFIP.S12299**

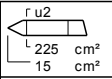
Project no.: **A275**

CPT no.: **VS-CPT03**    1/1



Test complete at 5.45m

Hole open to 5.17m Dry



Client : Jacobs  
 G.L. 0      W.L.: 0

Predrill : **0 m Predrilled**  
 Date: **29/10/2014**  
 Cone no.: **S15CFIP.S12299**  
 Project no.: **A275**  
 CPT no.: **VS-CPT04** | 1/1

Project: **CMA-SDL Works**  
 Location: **V4**  
 Position:

## Appendix D. Laboratory Test Certificates





## PARTICLE SIZE DISTRIBUTION

**CIVIL GEOTECHNICAL SERVICES**

6 - 8 Rose Avenue, Croydon 3136

Job No 14202  
 Report No 14202/R105  
 Date of Issue 28/11/14

Client JAC BS S M (M LB R )	Tested by A R
Project S 79600.002 SDL ADJ STM TS PR J CTS	Date tested 27/11/14
Location CT RA	Checked by PJF

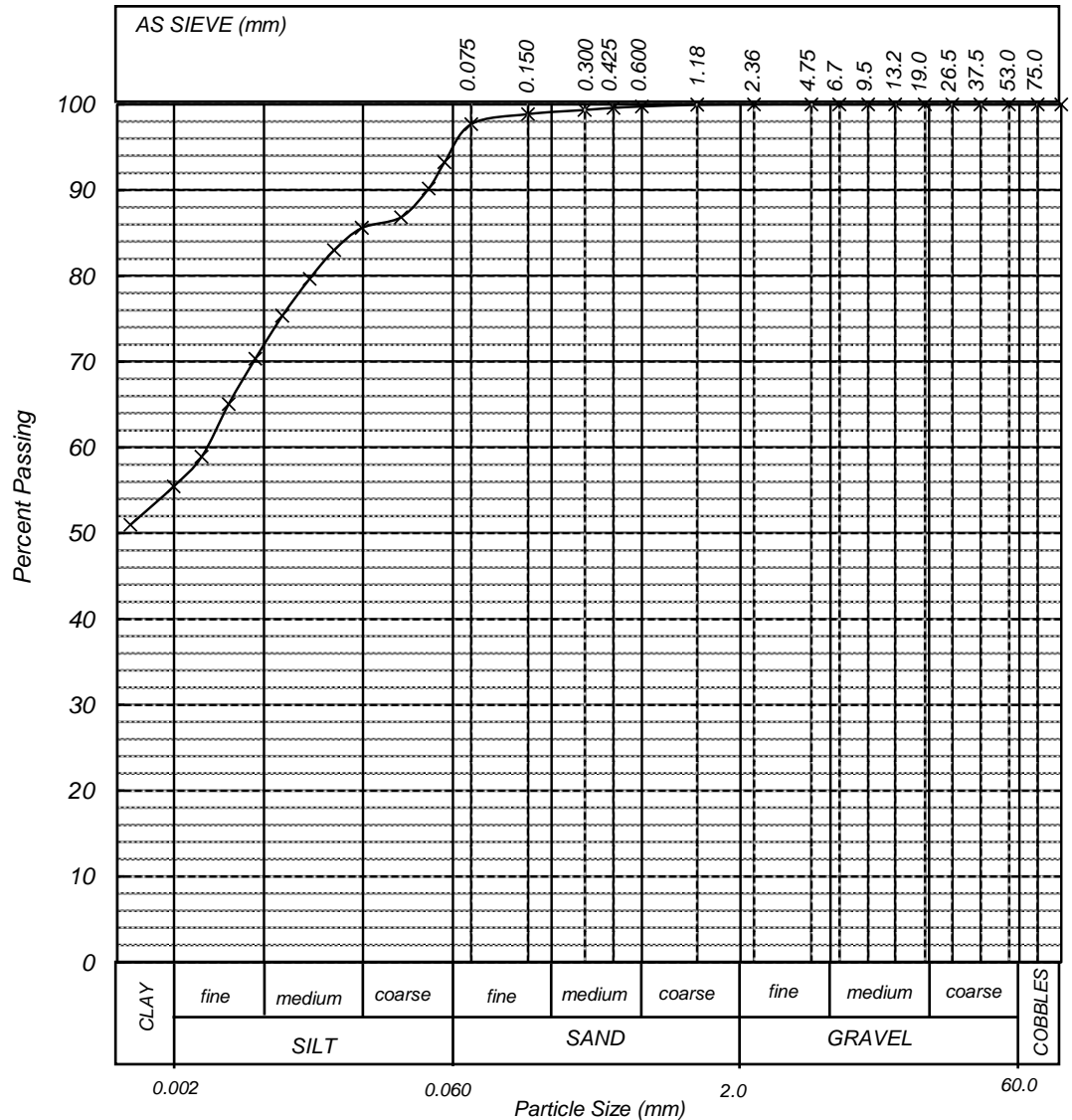
Sample Identification -TP04 1.5m	Sample No 14202098
Sample Description CLA high plasticit pale gre and brown	

Assumed soil particle density 2.65 g/cm<sup>3</sup>

AS 1289.3.6.1 and 3.6.3 - Particle Size Distribution - Standard method of fine analysis using a Hydrometer

Method of dispersion Mechanical	Loss in pretreatment 0%
Hydrometer type g/l	Variation to method -

Particle Size (mm)	Percent Passing
100.0	100
75.0	100
53.0	100
37.5	100
26.5	100
19.0	100
13.2	100
9.5	100
6.7	100
4.75	100
2.36	100
1.18	100
0.600	100
0.425	100
0.300	99
0.150	99
0.075	98
0.054	93
0.045	90
0.032	87
0.020	86
0.014	83
0.010	80
0.0075	75
0.0054	70
0.0039	65
0.0028	59
0.0020	55
0.0012	51



Gravel	Sand	Silt	Cobbles	0.0%
coarse	coarse	coarse	Gravel	0.0%
medium	medium	medium	Sand	5.4%
fine	fine	fine	Silt	39.1%
Total	Total	Total	Clay	55.5%
			Total	100.0%



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry



# PARTICLE SIZE DISTRIBUTION

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Job No 14202  
 Report No 14202/R106  
 Date of Issue 28/11/14

Client JAC B S M (M L B R )	Tested by A R
Project S 79600.002 SDL ADJ STM TS PR J CTS	Date tested 27/11/14
Location CT RA	Checked by PJF

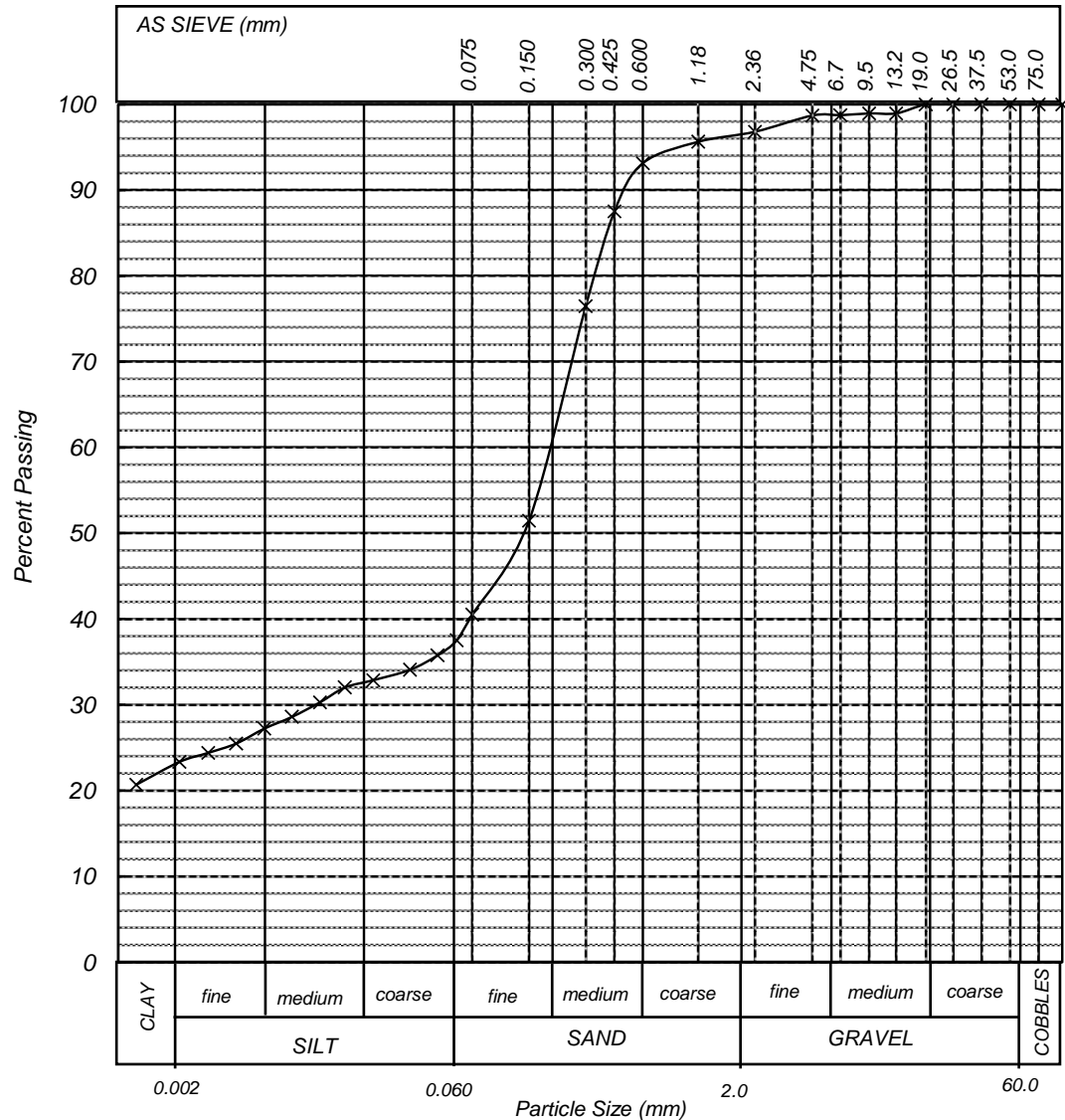
Sample Identification S-TP05 0 - 2.0m	Sample No 14202099
Sample Description cla e SA D fine to coarse dark brown and gre fines of low plasticit	

Assumed soil particle density 2.65 g/cm<sup>3</sup>

AS 1289.3.6.1 and 3.6.3 - Particle Size Distribution - Standard method of fine analysis using a Hydrometer

Method of dispersion Mechanical	Loss in pretreatment 0%	
Hydrometer type g/l	Variation to method -	

Particle Size (mm)	Percent Passing
100.0	100
75.0	100
53.0	100
37.5	100
26.5	100
19.0	100
13.2	99
9.5	99
6.7	99
4.75	99
2.36	97
1.18	96
0.600	93
0.425	88
0.300	76
0.150	51
0.075	40
0.062	37
0.049	36
0.035	34
0.022	33
0.016	32
0.012	30
0.0083	29
0.0059	27
0.0042	25
0.0030	24
0.0021	23
0.0012	21



Gravel	Sand	Silt	Cobbles	0.0%
coarse	coarse	coarse	Gravel	3.5%
medium	medium	medium	Sand	59.6%
fine	fine	fine	Silt	13.8%
Total	Total	Total	Clay	23.1%
			Total	100.0%



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry



# PARTICLE SIZE DISTRIBUTION

Job No 14202  
 Report No 14202/R107  
 Date of Issue 28/11/14

**CIVIL GEOTECHNICAL SERVICES**  
 6 - 8 Rose Avenue, Croydon 3136

Client JAC B S S M (M L B R )	Tested by A R
Project S 79600.002 SDL ADJ STM TS PR J CTS	Date tested 25/11/14
Location CT RA	Checked by PJF

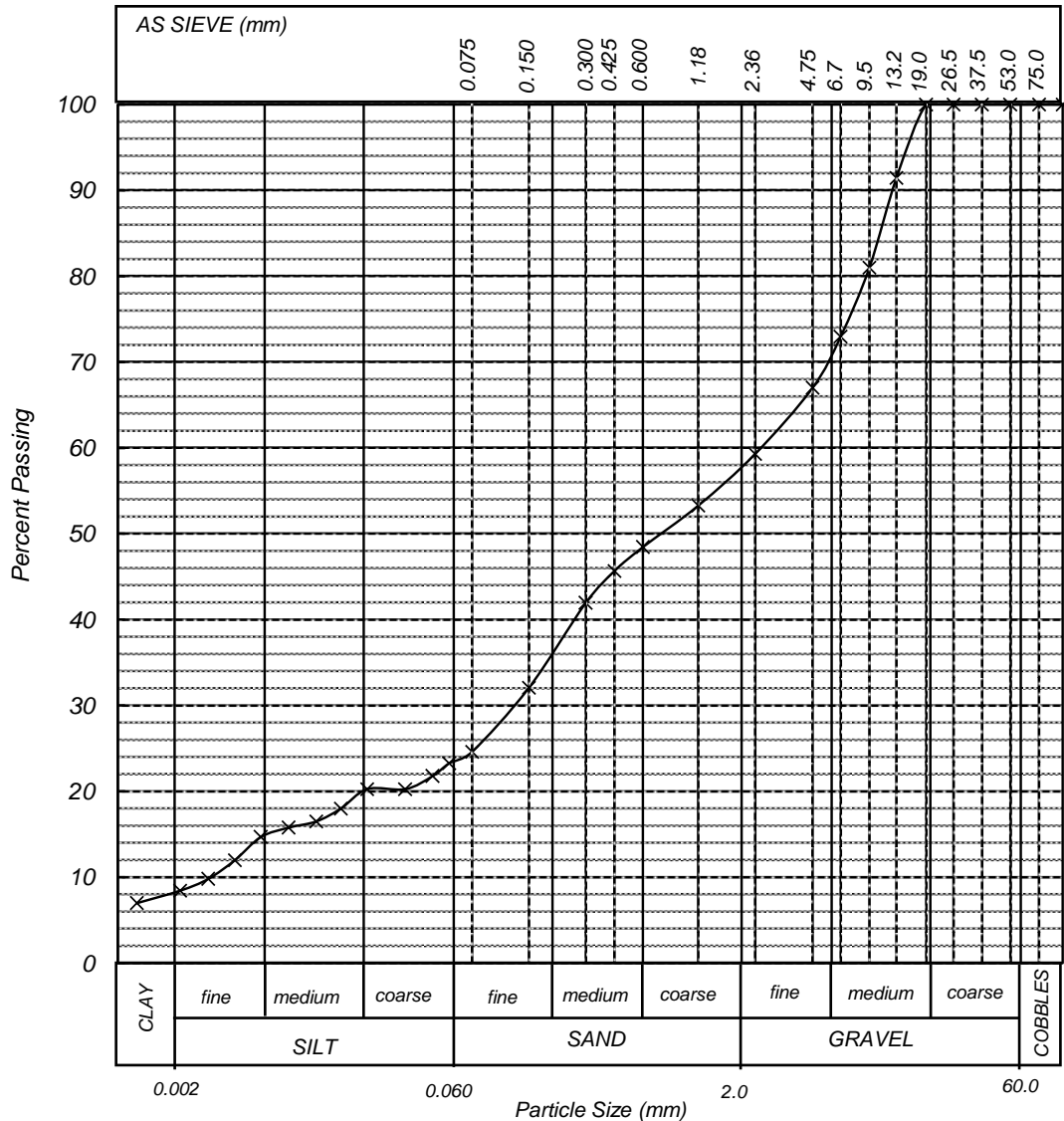
Sample Identification P A G L P T	Sample No 14202100
Sample Description silt / cla e GRA L fine to medium pale brown and white fines of low plasticit with fine to coarse sand	

Assumed soil particle density 2.65 g/cm<sup>3</sup>

AS 1289.3.6.1 and 3.6.3 - Particle Size Distribution - Sieve and Hydrometer

Method of dispersion	Mechanical	Loss in pretreatment	0%
Hydrometer type	g/l	Variation to method	-

Particle Size (mm)	Percent Passing
100.0	100
75.0	100
53.0	100
37.5	100
26.5	100
19.0	100
13.2	91
9.5	81
6.7	73
4.75	67
2.36	59
1.18	53
0.600	48
0.425	46
0.300	42
0.150	32
0.075	25
0.057	23
0.046	22
0.033	20
0.021	20
0.015	18
0.011	16
0.0080	16
0.0057	15
0.0042	12
0.0030	10
0.0021	8
0.0013	7



Gravel coarse	0.0%	Sand coarse	9.4%	Silt coarse	3.6%	Cobbles	0.0%
Gravel medium	29.0%	Sand medium	12.3%	Silt medium	5.1%	Gravel	42.2%
Gravel fine	13.2%	Sand fine	12.6%	Silt fine	6.6%	Sand	34.3%
Gravel Total	42.2%	Sand Total	34.3%	Silt Total	15.3%	Silt	15.3%
						Clay	8.2%
						Clay Total	100.0%



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

*(Signature)*

Approved Signatory : Peter Fry





# PARTICLE SIZE DISTRIBUTION

Job No 14202  
 Report No 14202/R108  
 Date of Issue 28/11/14

**CIVIL GEOTECHNICAL SERVICES**

6 - 8 Rose Avenue, Croydon 3136

Client JAC B S S M (M L B R )	Tested by A R
Project S 79600.002 SDL ADJ STM TS PR J CTS	Date tested 25/11/14
Location CT RA	Checked by PJF

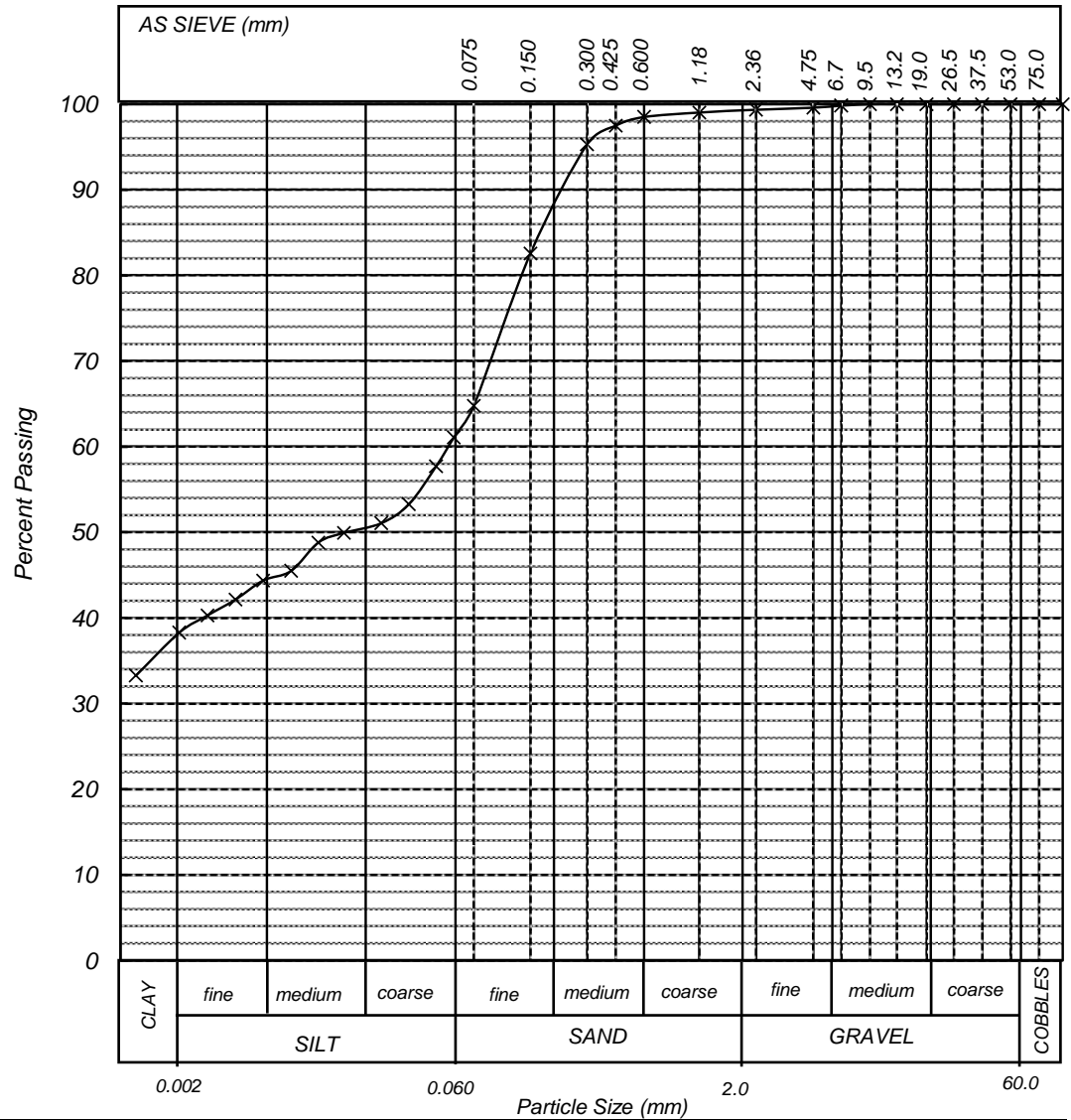
Sample Identification T RR B F LD PR P RT	Sample No 14202101
Sample Description sand CLA medium plasticit brown with pale gre fine to medium sand	

Assumed soil particle density 2.65 g/cm<sup>3</sup>

AS 1289.3.6.1 and 3.6.3 - Particle Size Distribution - Sieve and Hydrometer

Method of dispersion Mechanical	Loss in pretreatment 0%
Hydrometer type g/l	Variation to method -

Particle Size (mm)	Percent Passing
100.0	100
75.0	100
53.0	100
37.5	100
26.5	100
19.0	100
13.2	100
9.5	100
6.7	100
4.75	100
2.36	99
1.18	99
0.600	98
0.425	97
0.300	95
0.150	83
0.075	65
0.059	61
0.047	58
0.034	53
0.024	51
0.015	50
0.011	49
0.0080	45
0.0057	44
0.0041	42
0.0029	40
0.0020	38
0.0012	33



Gravel coarse	0.0%	Sand coarse	0.8%	Silt coarse	10.8%	Cobbles	0.0%
Gravel medium	0.3%	Sand medium	10.6%	Silt medium	6.0%	Gravel	0.8%
Gravel fine	0.5%	Sand fine	26.5%	Silt fine	6.5%	Sand	37.9%
Gravel Total	0.8%	Sand Total	37.9%	Silt Total	23.3%	Silt	23.3%
						Clay	38.0%
						Total	100.0%



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

*(Signature)*

Approved Signatory : Peter Fry



# PARTICLE SIZE DISTRIBUTION

Job No 14202  
 Report No 14202/R109  
 Date of Issue 28/11/14

**CIVIL GEOTECHNICAL SERVICES**

6 - 8 Rose Avenue, Croydon 3136

Client JAC B S S M (M L B R )	Tested by A R
Project S 79600.002 SDL ADJ STM TS PR J CTS	Date tested 25/11/14
Location CT RA	Checked by PJF

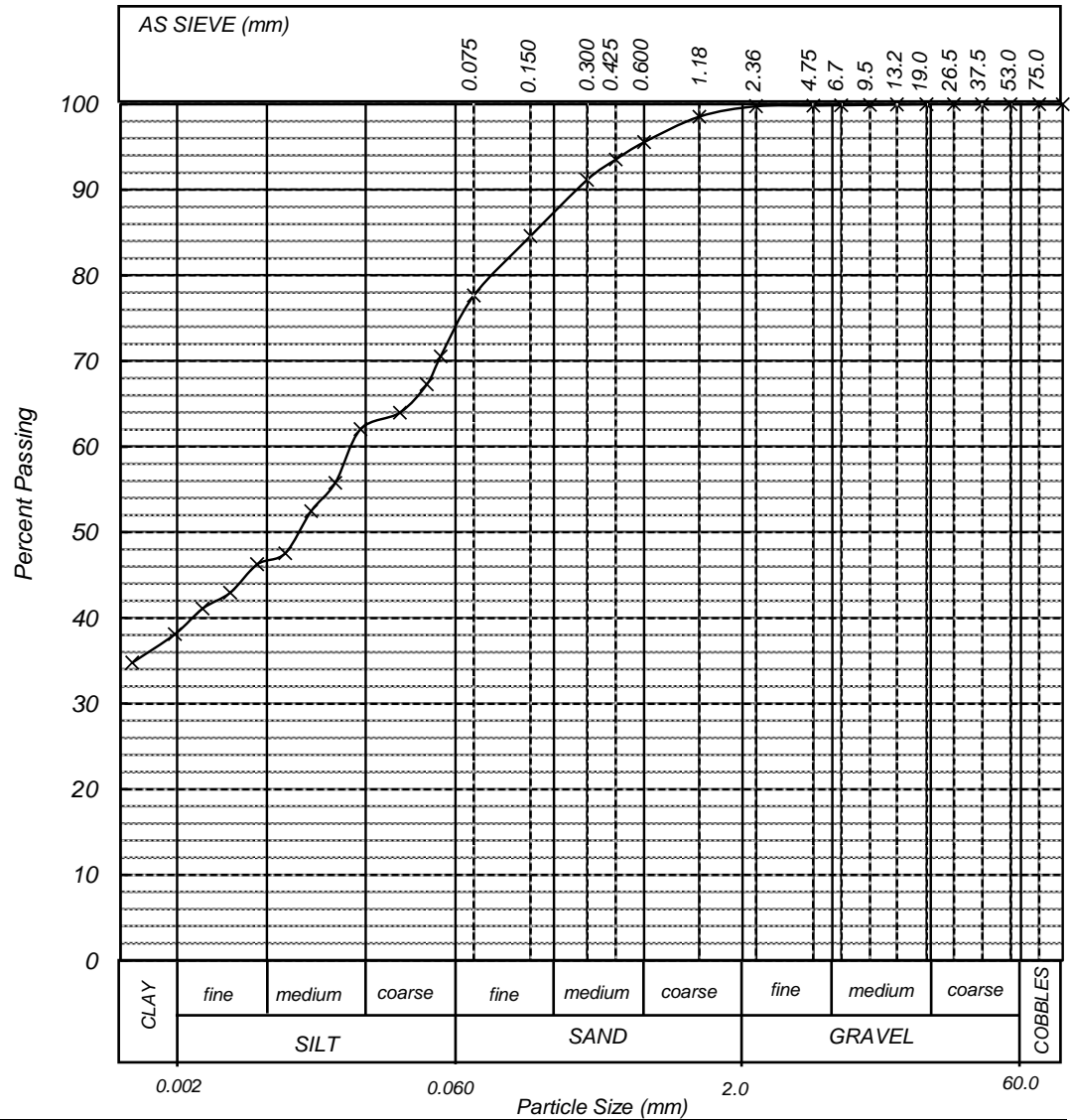
Sample Identification SHA C B R FARM	Sample No 14202102
Sample Description CLA medium plasticity pale grey / grey with fine to coarse sand	

Assumed soil particle density 2.65 g/cm<sup>3</sup>

AS 1289.3.6.1 and 3.6.3 - Particle Size Distribution - Sieve and Hydrometer

Method of dispersion	Mechanical	Loss in pretreatment	0%
Hydrometer type	g/l	Variation to method	-

Particle Size (mm)	Percent Passing
100.0	100
75.0	100
53.0	100
37.5	100
26.5	100
19.0	100
13.2	100
9.5	100
6.7	100
4.75	100
2.36	100
1.18	99
0.600	96
0.425	94
0.300	91
0.150	85
0.075	78
0.050	71
0.042	67
0.030	64
0.019	62
0.014	56
0.010	52
0.0075	48
0.0053	46
0.0038	43
0.0027	41
0.0020	38
0.0012	35



Gravel	Sand	Silt	Cobbles	
coarse	coarse	coarse	Gravel	0.0%
medium	medium	medium	Sand	0.5%
fine	fine	fine	Silt	25.7%
Total	Total	Total	Clay	35.5%
			Total	38.3%
				100.0%



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry



# STANDARD COMPACTION

AS 1289.5.1.1

**CIVIL GEOTECHNICAL SERVICES**

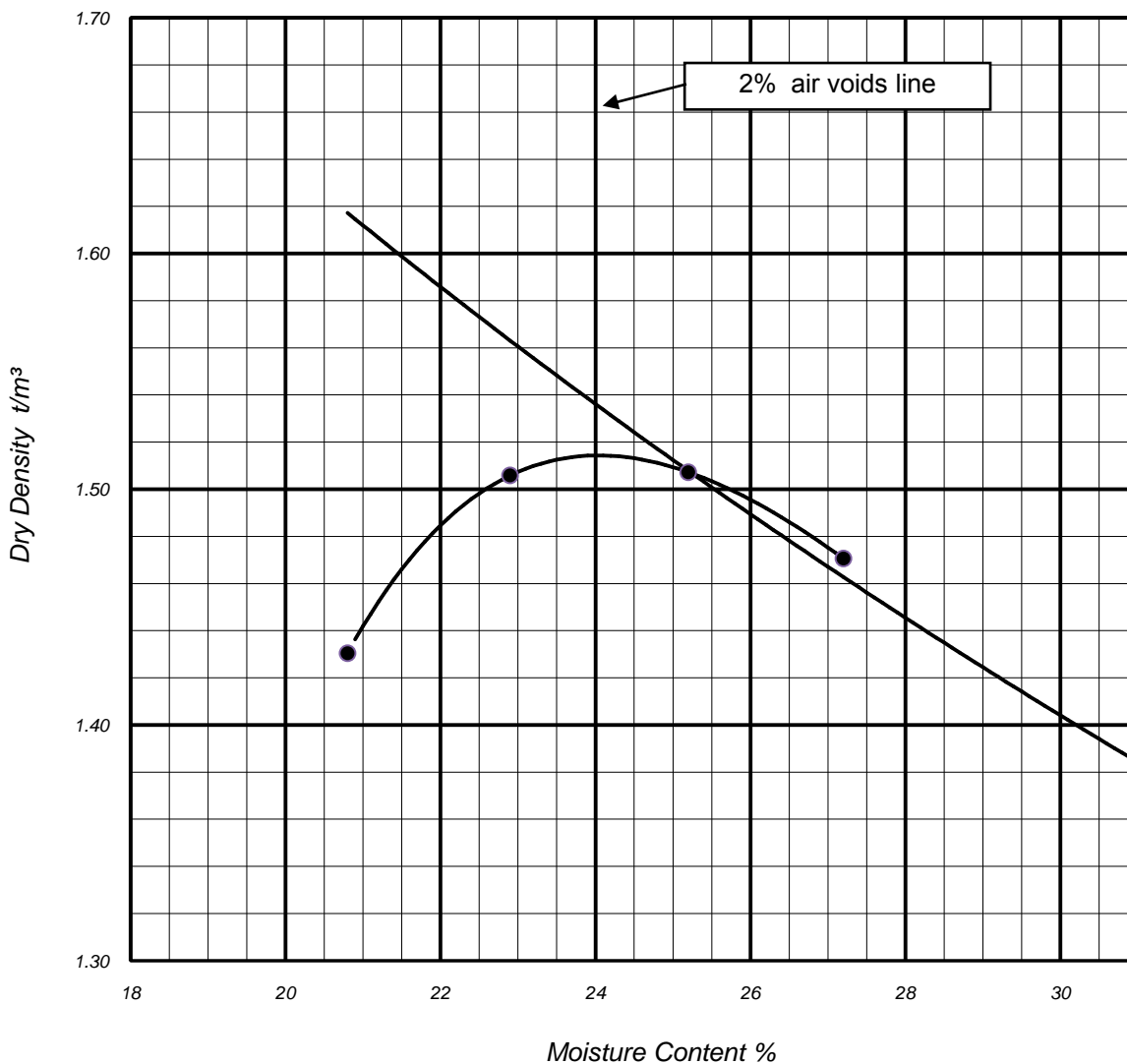
6 - 8 Rose Avenue, Croydon 3136

Job No 14202  
Report No 14202/R110  
Date of Issue 28/11/14

Client JAC B S S M (M L B R )	Tested by JM
Project S 79600.002 SDL ADJ STM TS PR J CTS	Date tested 19/11/14
Location CT RA	Checked by PJF
Sample Identification -TP04 1.5m	Sample No 14202098
Sample Description CLA high plasticit pale gre and brown	Sampled by Client Sampling date 2014
Oversize material retained on 19.0mm sieve = 0 %	Mould Type A
Maximum Dry Density 1.51 t/m <sup>3</sup>	Optimum Moisture Content 24.0 %

### DRY DENSITY - MOISTURE CONTENT PLOT

Calculated apparent particle density = 2.51 t/m<sup>3</sup>



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry





# STANDARD COMPACTION

AS 1289.5.1.1

## CIVIL GEOTECHNICAL SERVICES

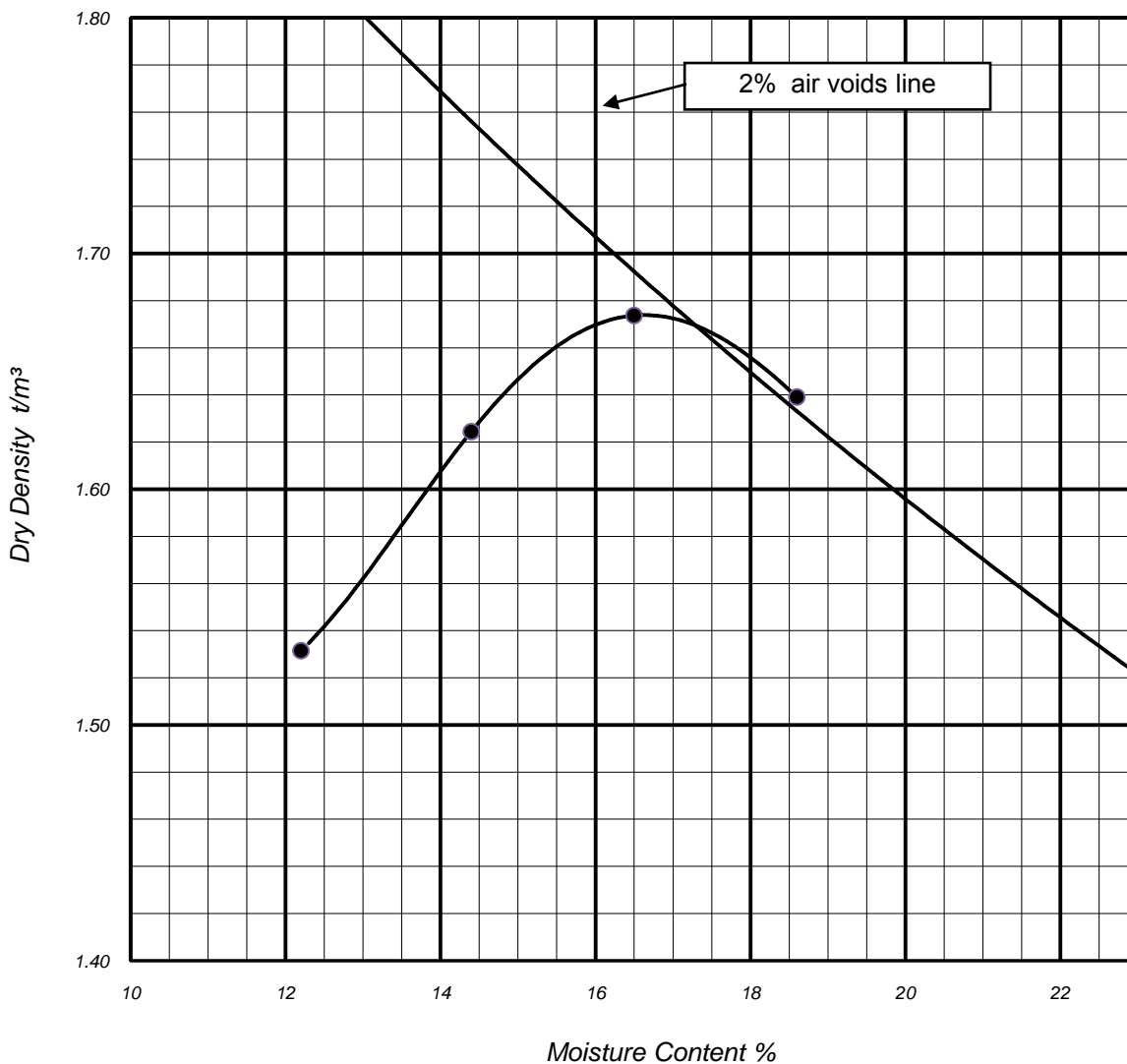
6 - 8 Rose Avenue, Croydon 3136

Job No 14202  
 Report No 14202/R111  
 Date of Issue 28/11/14

Client	JAC B S S M (M L B R )	Tested by	GB
Project	S 79600.002 SDL ADJ STM TS PR J CTS	Date tested	19/11/14
Location	CT R A	Checked by	PJF
Sample Identification	S-TP05 0 - 2.0m	Sample No	14202099
Sample Description	cla e SA D fine to coarse dark brown and gre fines of low plasticit	Sampled by	Client
		Sampling date	2014
Oversize material retained on 19.0mm sieve = 0 %	Mould Type	A	
Maximum Dry Density 1.67 t/m <sup>3</sup>	Optimum Moisture Content	16.5 %	

### DRY DENSITY - MOISTURE CONTENT PLOT

Calculated apparent particle density = 2.42 t/m<sup>3</sup>



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry



# STANDARD COMPACTION

AS 1289.5.1.1

## CIVIL GEOTECHNICAL SERVICES

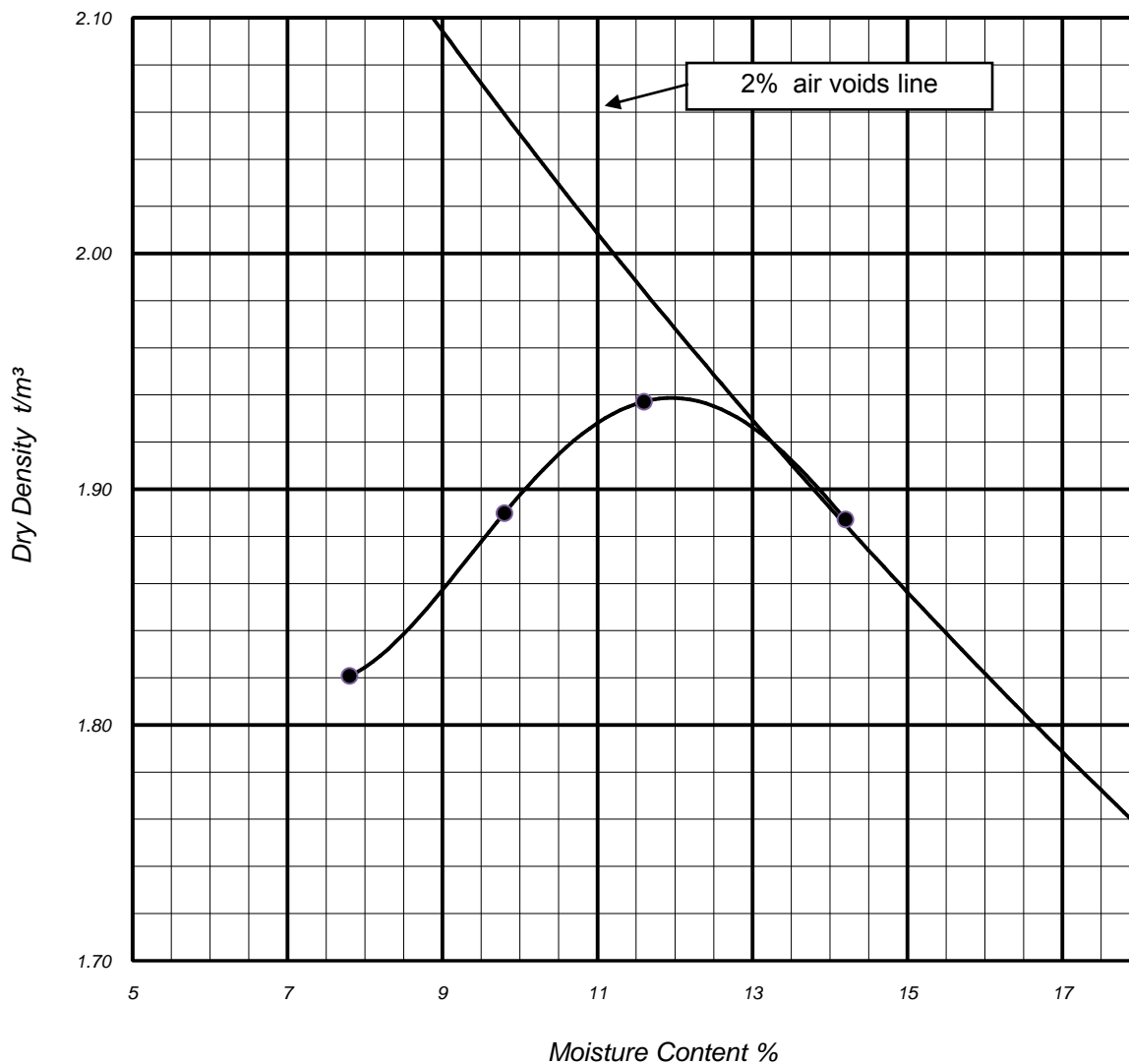
6 - 8 Rose Avenue, Croydon 3136

Job No 14202  
Report No 14202/R112  
Date of Issue 28/11/14

Client	JAC BSS M (M L B R )	Tested by	JM
Project	S 79600.002 SDL ADJ STM TS PR J CTS	Date tested	19/11/14
Location	CT RA	Checked by	PJF
Sample Identification	P A GL P T	Sample No	14202100
Sample Description	silt / cla e GRA L fine to medium pale brown and white fines of low plasticit with fine to coarse sand	Sampled by	Client
		Sampling date	2014
Oversize material retained on 19.0mm sieve = 0 %	Mould Type	A	
Maximum Dry Density 1.94 t/m <sup>3</sup>	Optimum Moisture Content	12.0 %	

### DRY DENSITY - MOISTURE CONTENT PLOT

Calculated apparent particle density = 2.65 t/m<sup>3</sup>



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry



# STANDARD COMPACTION

AS 1289.5.1.1

**CIVIL GEOTECHNICAL SERVICES**

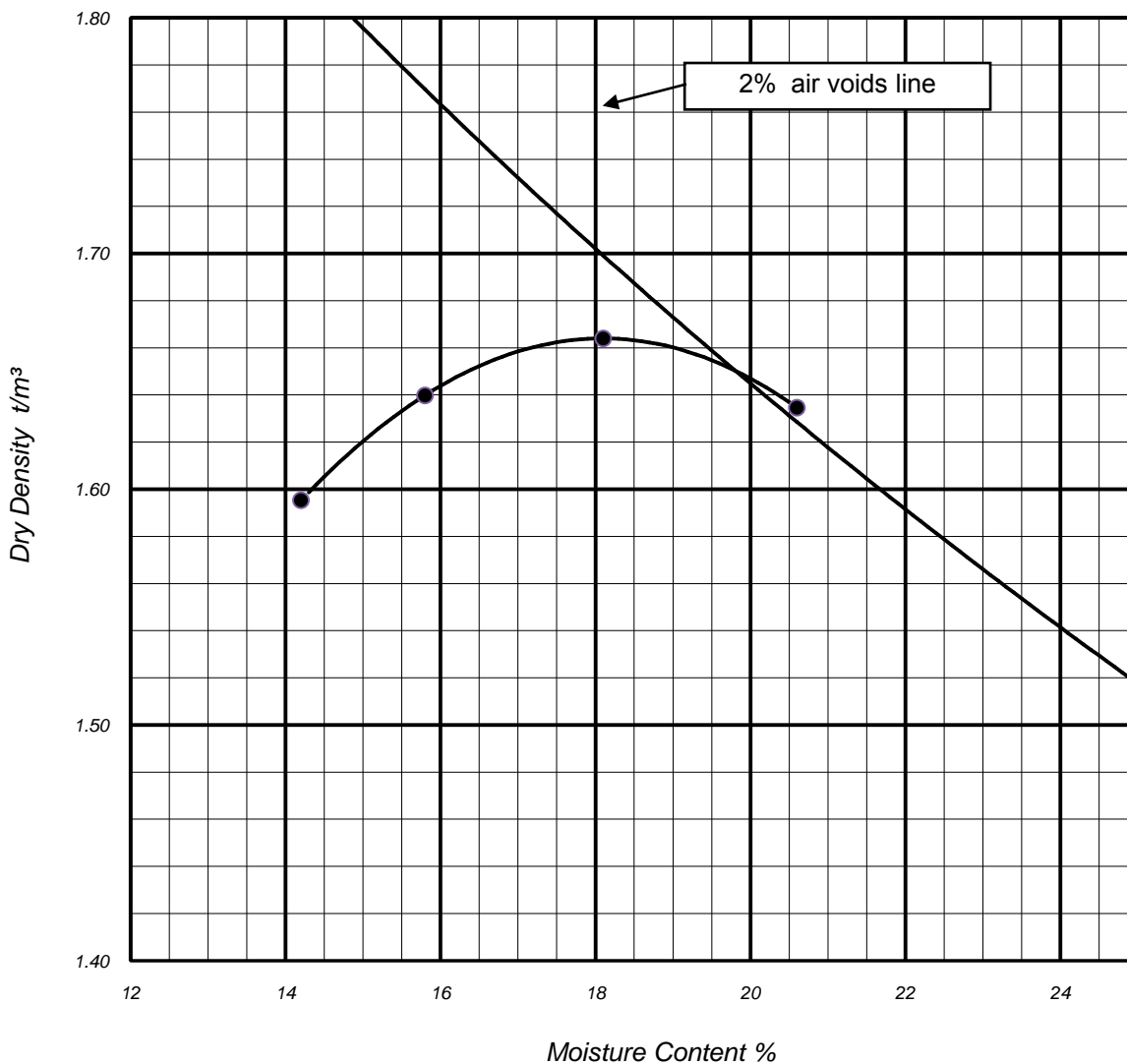
6 - 8 Rose Avenue, Croydon 3136

Job No 14202  
Report No 14202/R113  
Date of Issue 28/11/14

Client JAC B S S M ( M L B R )	Tested by GB
Project S 79600.002 SDL ADJ STM TS PR J CTS	Date tested 19/11/14
Location CT R A	Checked by PJF
Sample Identification T RR B F LD PR P RT	Sample No 14202101
Sample Description sand CLA medium plasticit brown with pale gre fine to medium sand	Sampled by Client Sampling date 2014
Oversize material retained on 19.0mm sieve = 0 %	Mould Type B
Maximum Dry Density 1.66 t/m <sup>3</sup>	Optimum Moisture Content 18.0 %

### DRY DENSITY - MOISTURE CONTENT PLOT

Calculated apparent particle density = 2.53 t/m<sup>3</sup>



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry





# STANDARD COMPACTION

AS 1289.5.1.1

## CIVIL GEOTECHNICAL SERVICES

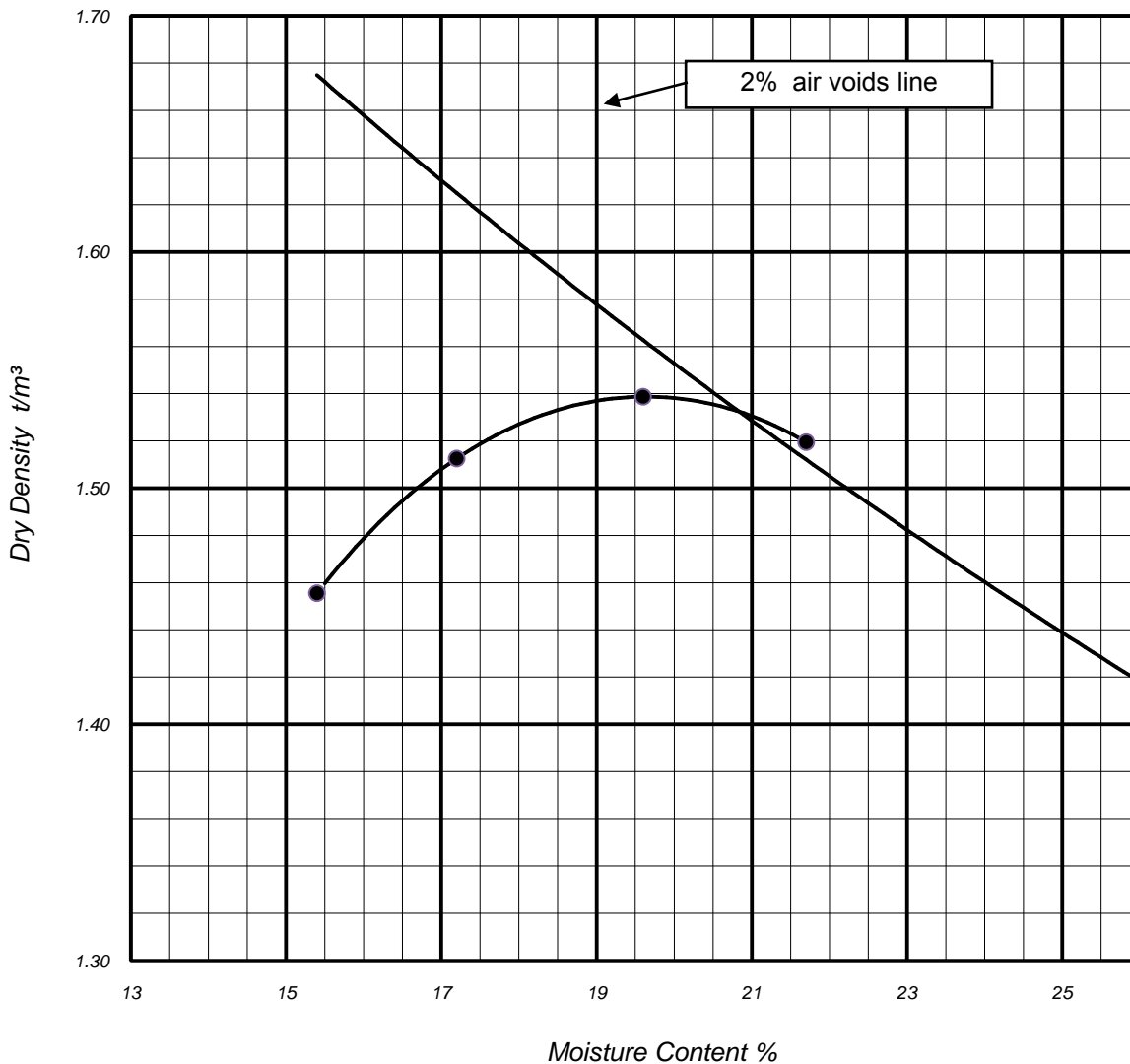
6 - 8 Rose Avenue, Croydon 3136

Job No 14202  
Report No 14202/R114  
Date of Issue 28/11/14

Client	JAC B S S M (M L B R )	Tested by	GB
Project	S 79600.002 SDL ADJ STM TS PR J CTS	Date tested	19/11/14
Location	CT R A	Checked by	PJF
Sample Identification	SHA C B R FARM	Sample No	14202102
Sample Description	CLA medium plasticit pale gre / gre with fine to coarse sand	Sampled by	Client
		Sampling date	2014
Oversize material retained on 19.0mm sieve = 0 %	Mould Type	A	
Maximum Dry Density	1.54 t/m <sup>3</sup>	Optimum Moisture Content	19.5 %

### DRY DENSITY - MOISTURE CONTENT PLOT

Calculated apparent particle density = 2.32 t/m<sup>3</sup>



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry

AS512-R8-MAR 13



## TEST RESULTS

AS 1289.2.1.1 3.1.2 3.2.1 3.3.1 3.4.1 3.6.1 3.8.1 6.4.1 (Clauses 4 and 5a)

Job No 14202  
Report No 14202/R115  
Date of Issue 28/11/14

### CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Tested by S  
Date tested 25/11/14  
Checked by PJF

Client JAC B S S M (M L B R )  
Project S 79600.002 SDL ADJ STM TS PR J CTS  
Location CT R A

Sample Identification	Soil Description	Field Moisture Content %	Dry Density t/m <sup>3</sup>	Liquid Limit %	Plastic Limit %	Plasticity Index %	Linear Shrinkage %	% Passing 75µm sieve	Emerson Class No*	Emerson Class No**
14202098 -T -TP04 1.5m	CLA high plasticit pale gre and brown	20.7	-	50	20	30	13.0	98	3	5
14202099 S-T P05 0 - 2.0m	clae SA D fine to coarse dark brown and gre fines of low plasticit	10.1	-	32	15	17	8.5	40	4	4
14202100 P A P A GL P T	silt / clae GRA L fine to medium pale brown and white fines of low plasticit with fine to coarse sand	3.7	-	23	17	6	3.0	25	4	4
14202101 T RR LD PR P RT	sand CLA medium plasticit brown with pale gre fine to medium sand	5.7	-	42	16	26	13.0	65	3	3
14202102 SHA C B R FARM	CLA medium plasticit pale gre / gre with fine to coarse sand	6.8	-	43	19	24	11.0	78	3	3

**Notes**  
 AS 1289.3.1.2,3.2.1,3.4.1 Method of drying: Air dried AS 1289.3.8.1 Water used: \* Distilled water River water  
 Dry/Wet sieve: Dr Temperature: 20.2 °C 20.2 °C  
 Curing time: >24hrs Date sampled: 2014 2014

SUMMARY4 V1.3 MAR 13



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025 Accreditation No 9909

Approved Signatory : Peter Fry





# PARTICLE SIZE DISTRIBUTION

AS 1289.3.6.1

Job No 14443  
 Report No 14443/R002  
 Date of Issue 04/12/14

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Client	JAC B S S M (M L B R )	Tested by	BG
Project	S 79600.002 SDL ADJ STM T PR J CTS	Date tested	26/11/14
Location	A MALL CMA	Checked by	PJF

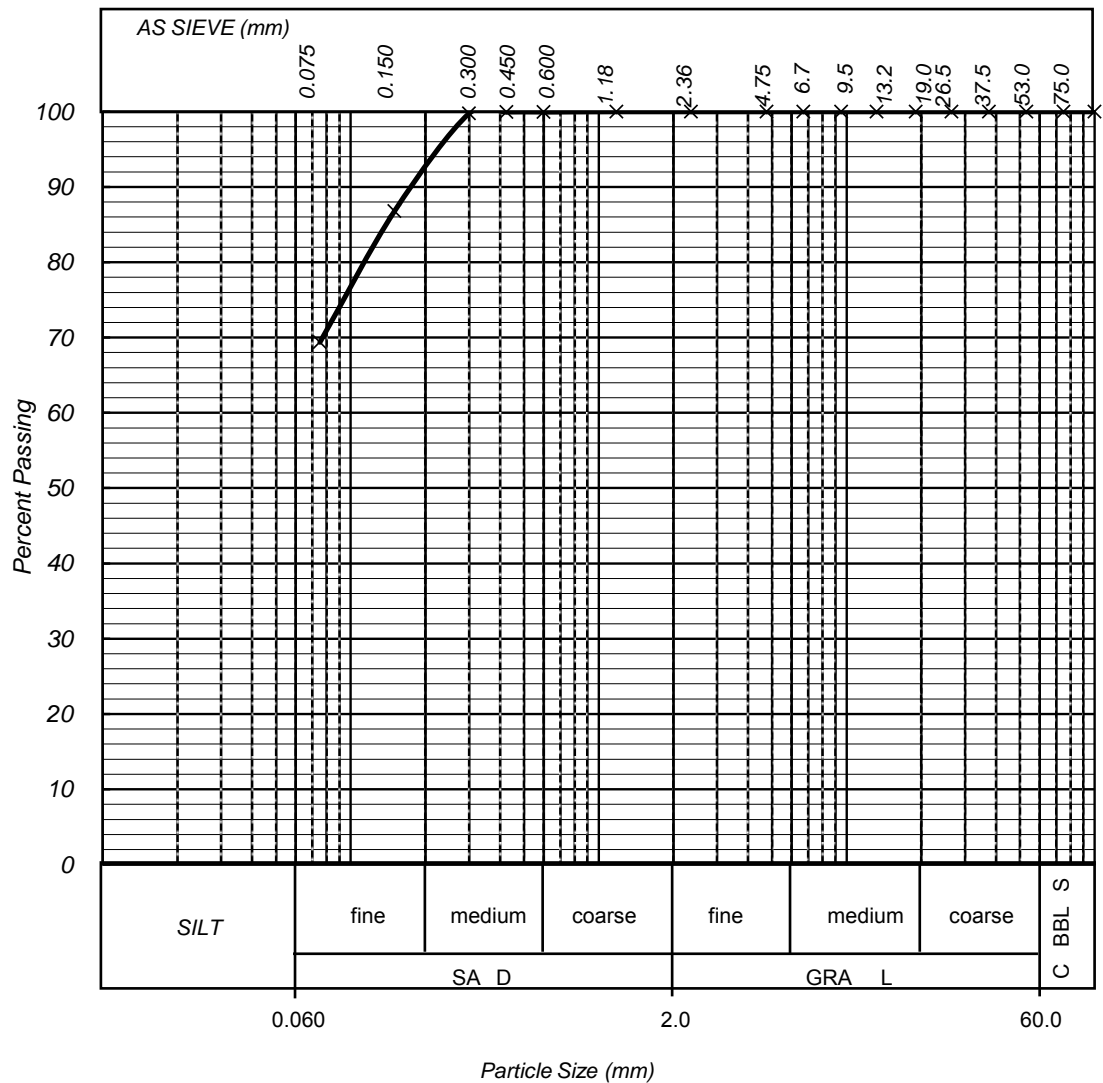
Sample Identification	BC -BH01 4.9m	Sample No	14443002
Sampling method	B Client	Sampled by	Client
		Sampling date	2014

### Sample Description

sand CLA low plasticit light gre with orange-brown fine to medium sand

### Particle Size Distribution

Particle Size (mm)	Percent Passing
100.0	100
75.0	100
53.0	100
37.5	100
26.5	100
19.0	100
13.2	100
9.5	100
6.7	100
4.75	100
2.36	100
1.18	100
0.600	100
0.425	100
0.300	100
0.150	87
0.075	69



Gravel coarse	0.0%	Sand coarse	0.0%	Cobbles	0.0%
Gravel medium	0.0%	Sand medium	7.8%	Gravel	0.0%
Gravel fine	0.0%	Sand fine	22.8%	Sand	30.6%
Total	0.0%	Total	30.6%	Fines	69.4%
				Total	100.0%



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry





# PARTICLE SIZE DISTRIBUTION

AS 1289.3.6.1

Job No 14443  
 Report No 14443/R003  
 Date of Issue 04/12/14

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Tested by S  
 Date tested 02/12/14  
 Checked by PJF

Client JAC B S S M (M L B R )  
 Project S 79600.002 SDL ADJ STM T PR J CTS  
 Location A MALL CMA

Sample Identification BC -BH02 0.7 - 1.1m  
 Sampling method B Client

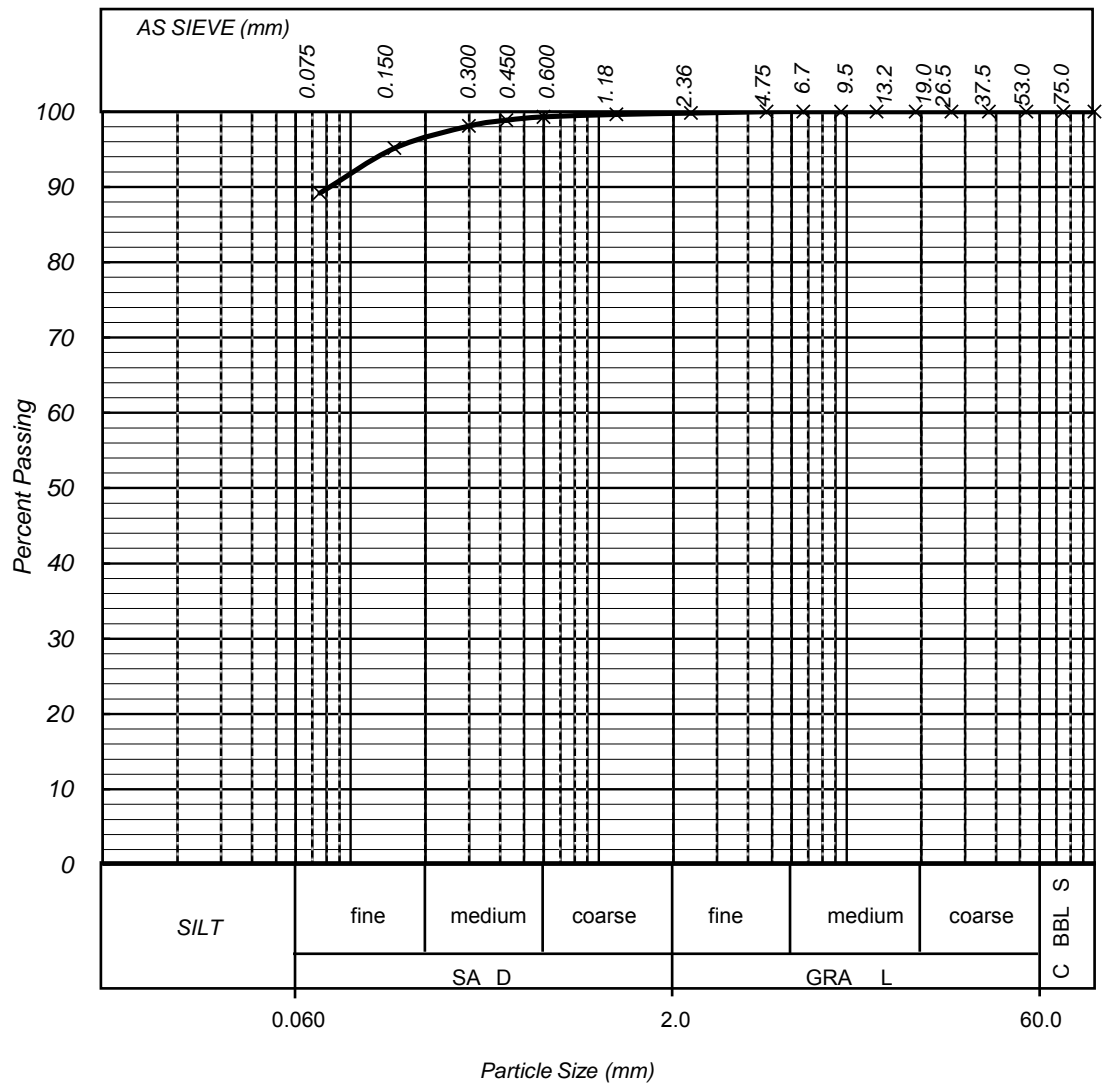
Sample No 14443003  
 Sampled by Client  
 Sampling date 2014

### Sample Description

CLA medium plasticity light grey with brown trace of fine to medium sand

### Particle Size Distribution

Particle Size (mm)	Percent Passing
100.0	100
75.0	100
53.0	100
37.5	100
26.5	100
19.0	100
13.2	100
9.5	100
6.7	100
4.75	100
2.36	100
1.18	100
0.600	99
0.425	99
0.300	98
0.150	95
0.075	89



Gravel coarse	0.0%	Sand coarse	0.5%	Cobbles	0.0%
Gravel medium	0.0%	Sand medium	2.9%	Gravel	0.2%
Gravel fine	0.2%	Sand fine	7.2%	Sand	10.6%
Total	0.2%	Total	10.6%	Fines	89.2%
				Total	100.0%

A361 V1.5 MAR 13



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025  
 Accreditation No 9909

Approved Signatory : Peter Fry



# PARTICLE SIZE DISTRIBUTION

AS 1289.3.6.1

Job No 14443  
 Report No 14443/R004  
 Date of Issue 04/14/14

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Tested by S  
 Date tested 27/11/14  
 Checked by PJF

Client JAC B S S M (M L B R )  
 Project S 79600.002 SDL ADJ STM T PR J CTS  
 Location A MALL CMA

Sample Identification BCM-BH02 1.5 - 1.75m  
 Sampling method B Client

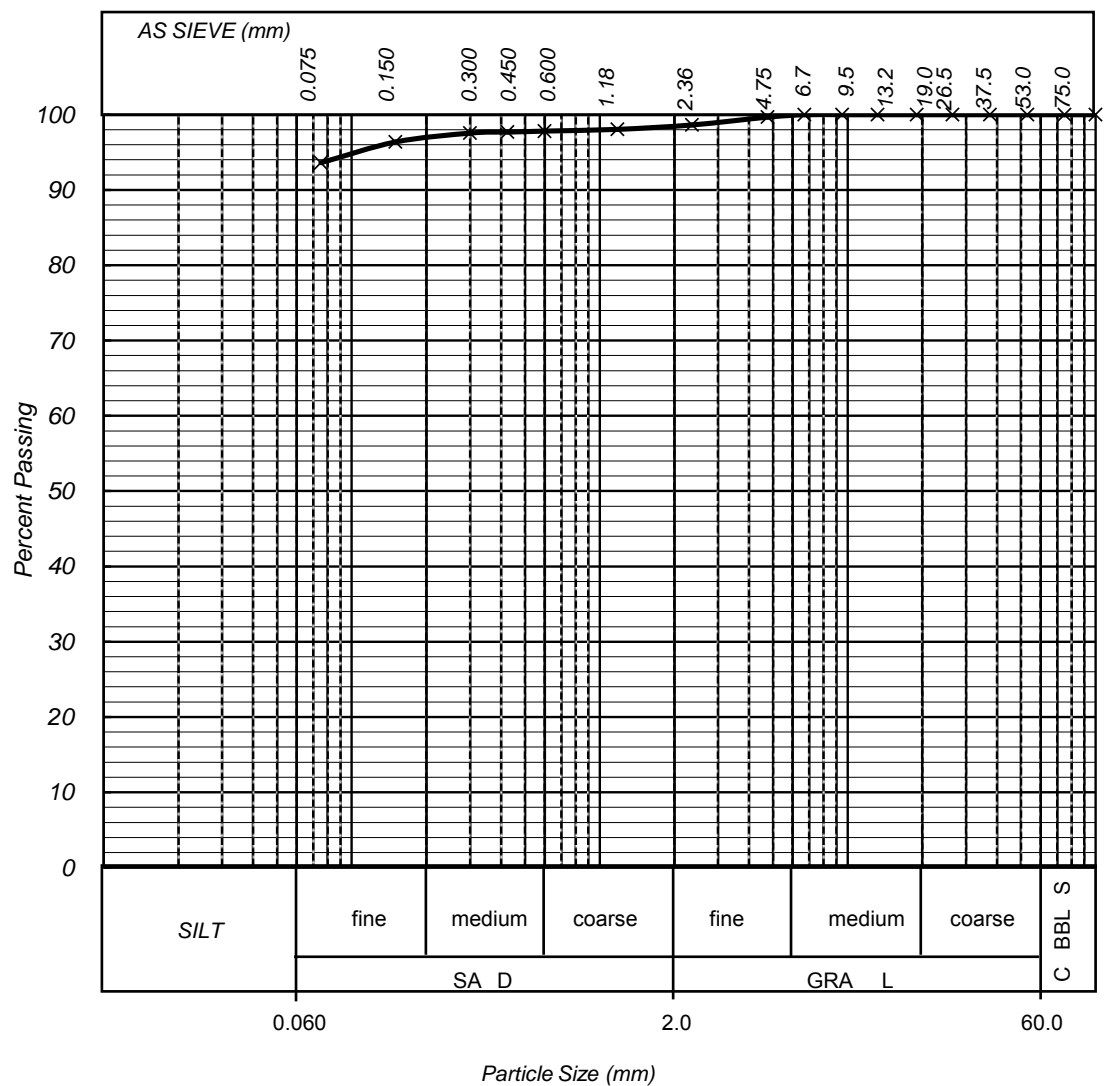
Sample No 14443004  
 Sampled by Client  
 Sampling date 2014.

### Sample Description

CLA high plasticit pale gre

### Particle Size Distribution

Particle Size (mm)	Percent Passing
100.0	100
75.0	100
53.0	100
37.5	100
26.5	100
19.0	100
13.2	100
9.5	100
6.7	100
4.75	100
2.36	99
1.18	98
0.600	98
0.425	98
0.300	98
0.150	96
0.075	94



Gravel coarse	0.0%	Sand coarse	0.7%	Cobbles	0.0%
Gravel medium	0.1%	Sand medium	0.9%	Gravel	1.5%
Gravel fine	1.4%	Sand fine	3.3%	Sand	4.9%
Total	1.5%	Total	4.9%	Fines	93.6%
				Total	100.0%

A361 V1.5 MAR 13



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025  
 Accreditation No 9909

Approved Signatory : Peter Fry



# PARTICLE SIZE DISTRIBUTION

**CIVIL GEOTECHNICAL SERVICES**

6 - 8 Rose Avenue, Croydon 3136

Job No 14443  
 Report No 14443/R005  
 Date of Issue 04/12/14

Client JAC B S S M (M L B R )	Tested by A R
Project S 79600.002 SDL ADJ STM T PR J CTS	Date tested 03/12/14
Location A MALL CMA	Checked by PJF

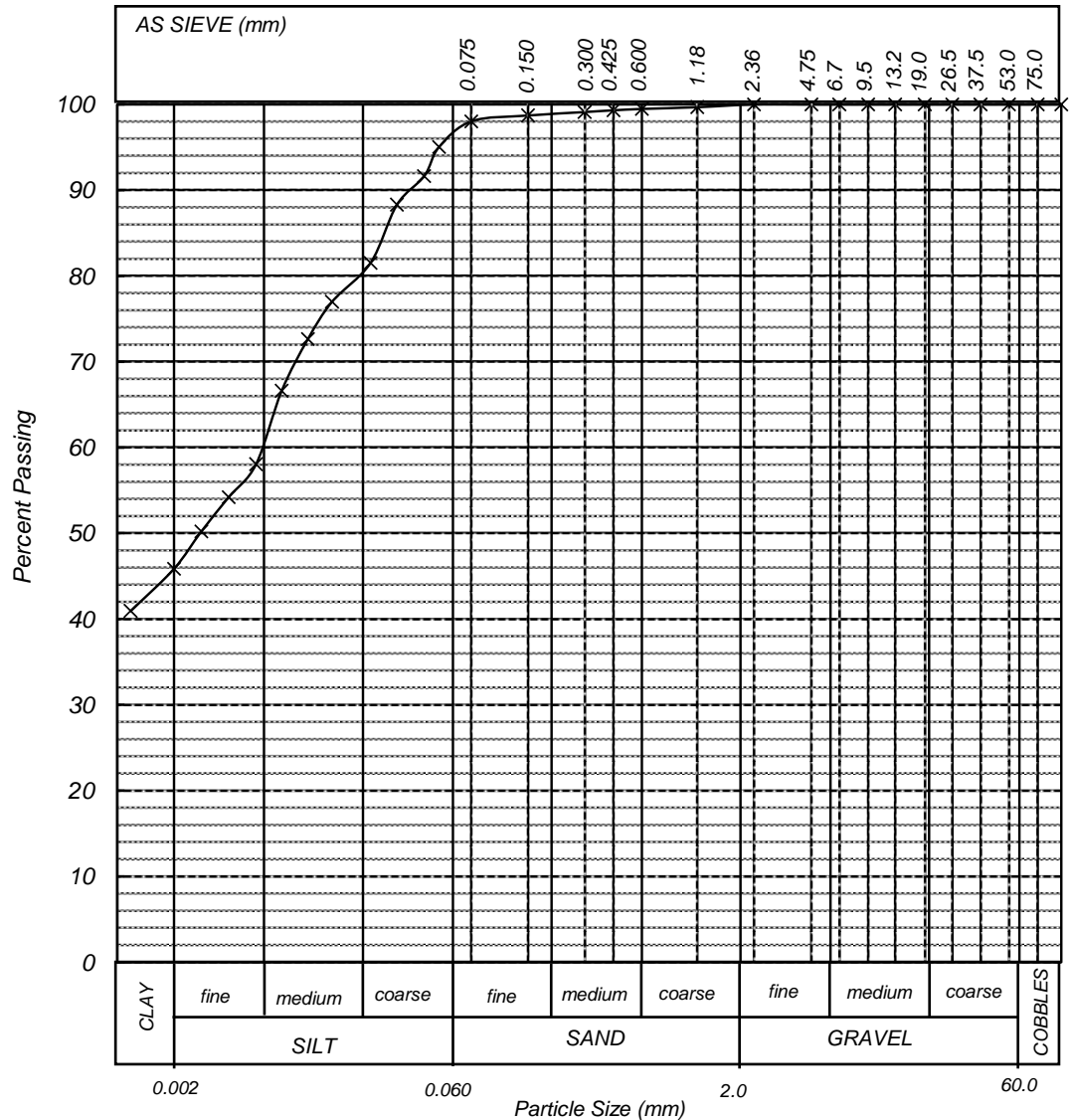
Sample Identification -BH01 1.9 - 2.15m	Sample No 14443006
Sample Description CLA high plasticit pale gre and orange / brown	

Assumed soil particle density 2.65 g/cm<sup>3</sup>

AS 1289.3.6.1 and 3.6.3 - Particle Size Distribution - Standard method of fine analysis using a Hydrometer

Method of dispersion Mechanical	Loss in pretreatment 0%	
Hydrometer type g/l	Variation to method -	

Particle Size (mm)	Percent Passing
100.0	100
75.0	100
53.0	100
37.5	100
26.5	100
19.0	100
13.2	100
9.5	100
6.7	100
4.75	100
2.36	100
1.18	100
0.600	99
0.425	99
0.300	99
0.150	99
0.075	98
0.051	95
0.042	92
0.030	88
0.022	82
0.014	77
0.010	73
0.0074	67
0.0054	58
0.0039	54
0.0028	50
0.0020	46
0.0012	41



Gravel	Sand	Silt	Cobbles	
coarse 0.0%	coarse 0.5%	coarse 15.7%	Gravel 0.1%	
medium 0.0%	medium 0.6%	medium 19.8%	Sand 3.6%	
fine 0.1%	fine 2.5%	fine 14.9%	Silt 50.4%	
Total 0.1%	Total 3.6%	Total 50.4%	Clay 45.9%	
			Total 100.0%	



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry



## PARTICLE SIZE DISTRIBUTION

### CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Job No 14443  
 Report No 14443/R006  
 Date of Issue 04/12/14

Client JAC B S S M (M L B R )	Tested by A R
Project S 79600.002 SDL ADJ STM T PR J CTS	Date tested 03/12/14
Location A MALL CMA	Checked by PJF

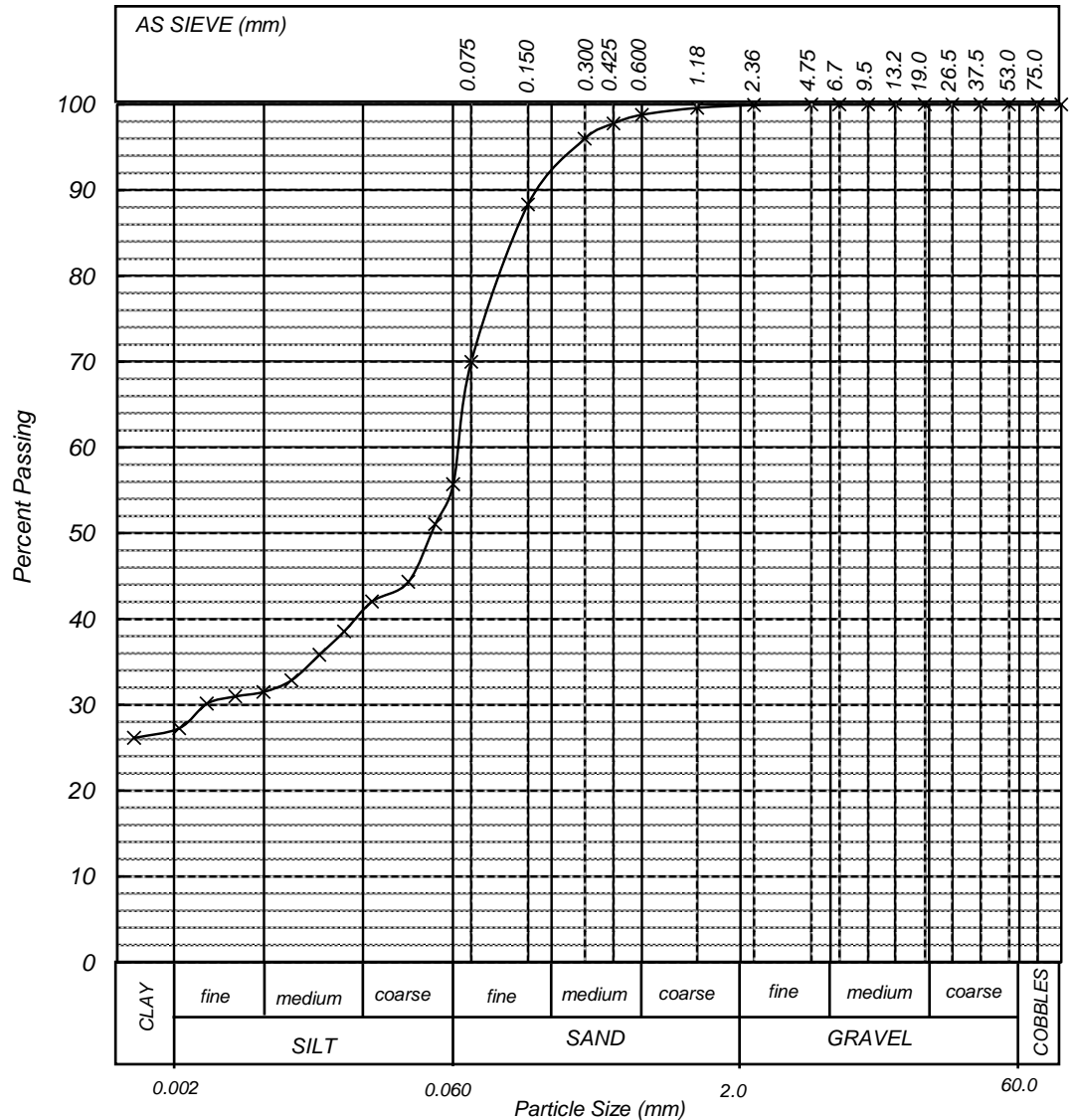
Sample Identification S-BH01 1.5m	Sample No 14443008
Sample Description sand CLA low plasticit brown fine to medium sand	

Assumed soil particle density 2.65 g/cm<sup>3</sup>

AS 1289.3.6.1 and 3.6.3 - Particle Size Distribution - Standard method of fine analysis using a Hydrometer

Method of dispersion Mechanical	Loss in pretreatment 0%	
Hydrometer type g/l	Variation to method -	

Particle Size (mm)	Percent Passing
100.0	100
75.0	100
53.0	100
37.5	100
26.5	100
19.0	100
13.2	100
9.5	100
6.7	100
4.75	100
2.36	100
1.18	100
0.600	99
0.425	98
0.300	96
0.150	88
0.075	70
0.060	56
0.048	51
0.035	44
0.022	42
0.016	39
0.012	36
0.0084	33
0.0060	31
0.0042	31
0.0030	30
0.0021	27
0.0012	26



Gravel	Sand	Silt	Cobbles	
coarse 0.0%	coarse 1.0%	coarse 14.5%	Gravel 0.2%	
medium 0.0%	medium 7.3%	medium 9.4%	Sand 44.5%	
fine 0.2%	fine 36.2%	fine 4.3%	Silt 28.2%	
Total 0.2%	Total 44.5%	Total 28.2%	Clay 27.1%	
			Total 100.0%	



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry





# PARTICLE SIZE DISTRIBUTION

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Job No 14443  
 Report No 14443/R007  
 Date of Issue 04/12/14

Client	JAC B S M (M L B R )	Tested by	A R
Project	S 79600.002 SDL ADJ STM T PR J CTS	Date tested	03/12/14
Location	A MALL CMA	Checked by	PJF

Sample Identification	S-BH01 3.5m	Sample No	14443010
-----------------------	-------------	-----------	----------

**Sample Description**

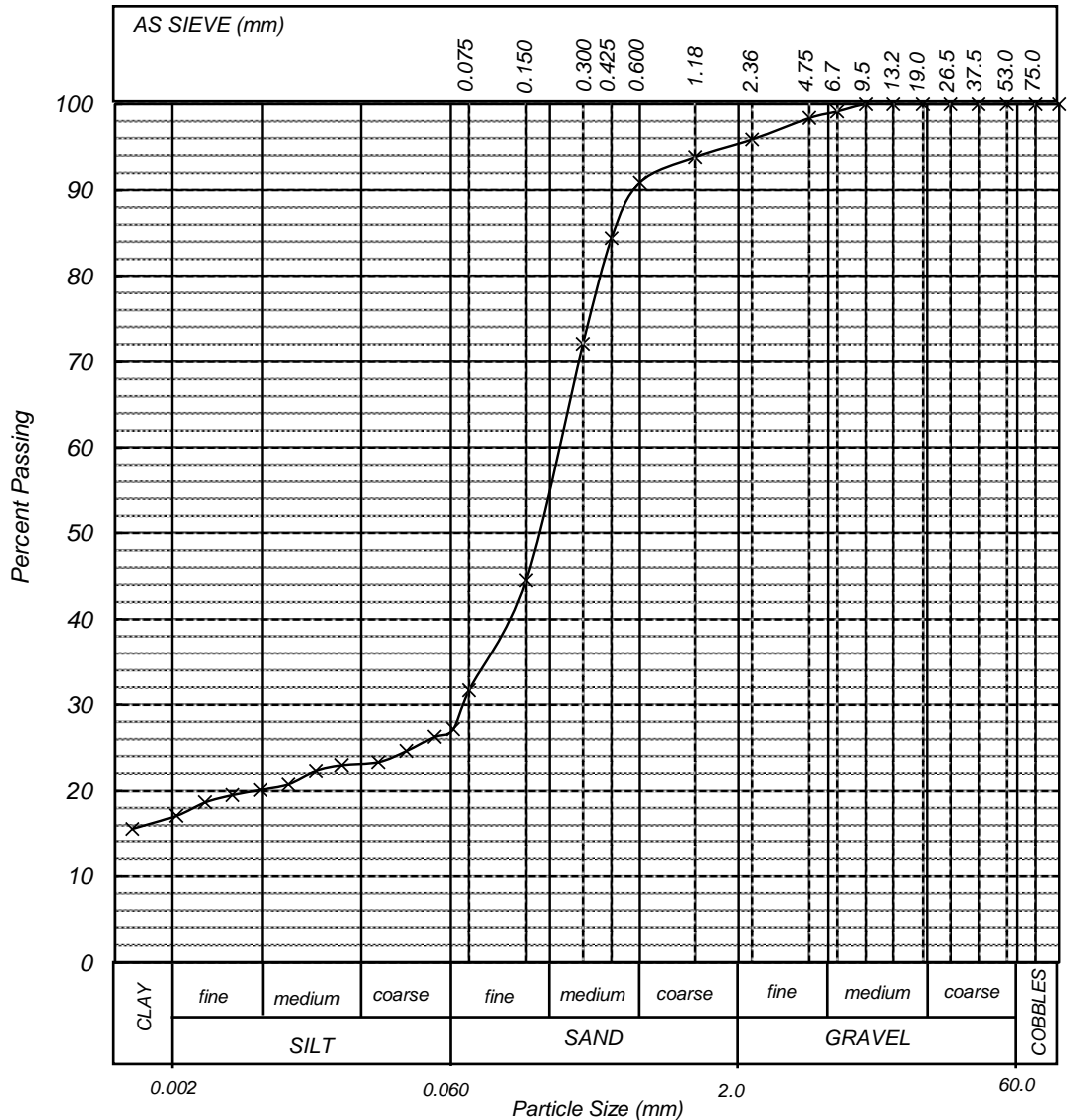
clayey sand fine to coarse dark brown fines of low plasticity

Assumed soil particle density 2.65 g/cm<sup>3</sup>

**AS 1289.3.6.1 and 3.6.3 - Particle Size Distribution - Standard method of fine analysis using a Hydrometer**

Method of dispersion	Mechanical	Loss in pretreatment	0%
Hydrometer type	g/l	Variation to method	-

Particle Size (mm)	Percent Passing
100.0	100
75.0	100
53.0	100
37.5	100
26.5	100
19.0	100
13.2	100
9.5	100
6.7	99
4.75	98
2.36	96
1.18	94
0.600	91
0.425	84
0.300	72
0.150	45
0.075	32
0.062	27
0.049	26
0.035	25
0.025	23
0.016	23
0.012	22
0.0083	21
0.0059	20
0.0042	19
0.0030	19
0.0021	17
0.0012	16



Gravel	Sand	Silt	Cobbles	
coarse 0.0%	coarse 4.5%	coarse 3.4%	Gravel 4.6%	
medium 1.1%	medium 34.9%	medium 3.0%	Sand 68.8%	
fine 3.5%	fine 29.4%	fine 3.3%	Silt 9.7%	
Total 4.6%	Total 68.8%	Total 9.7%	Clay 16.9%	
			Total 100.0%	



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry



# PARTICLE SIZE DISTRIBUTION

AS 1289.3.6.1

Job No 14443  
 Report No 14443/R009  
 Date of Issue 03/12/14

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Client	JAC B S S M (M L B R )	Tested by	S
Project	S 79600.002 SDL ADJ STM T PR J CTS	Date tested	27/11/14
Location	A MALL CMA	Checked by	PJF

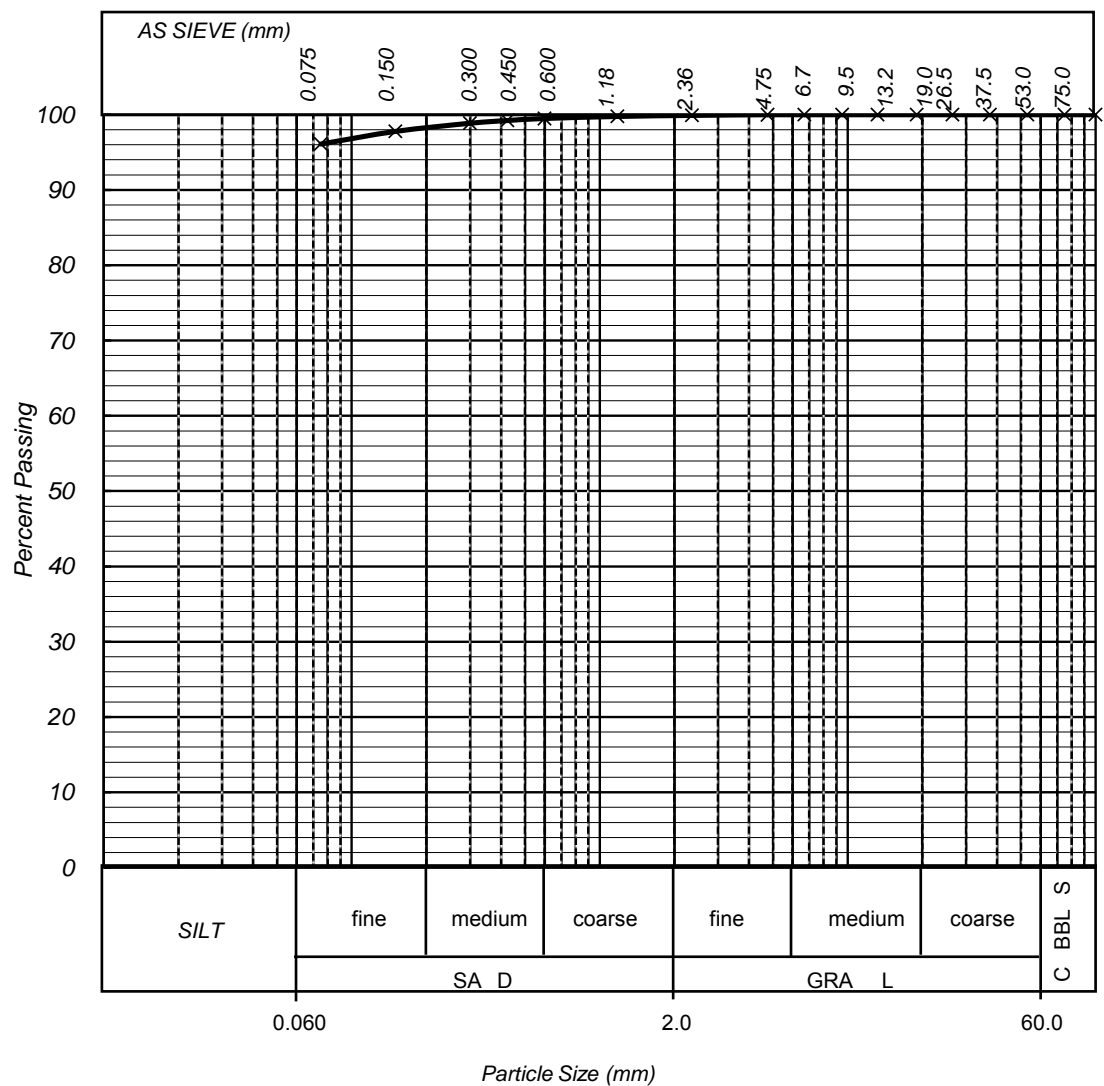
Sample Identification	S-BH02 1.5 - 1.9m	Sample No	14443012
Sampling method	B Client	Sampled by	Client
		Sampling date	2014

### Sample Description

CLA high plasticit pale gre and brown

### Particle Size Distribution

Particle Size (mm)	Percent Passing
100.0	100
75.0	100
53.0	100
37.5	100
26.5	100
19.0	100
13.2	100
9.5	100
6.7	100
4.75	100
2.36	100
1.18	100
0.600	99
0.425	99
0.300	99
0.150	98
0.075	96



Gravel coarse	0.0%	Sand coarse	0.4%	Cobbles	0.0%
Gravel medium	0.0%	Sand medium	1.2%	Gravel	0.1%
Gravel fine	0.1%	Sand fine	2.2%	Sand	3.8%
Total	0.1%	Total	3.8%	Fines	96.1%
				Total	100.0%



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry



# TRIAXIAL TEST

AS 1289.6.4.1

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Job No 14443  
 Report No 14443/R010  
 Issue date 04/12/14

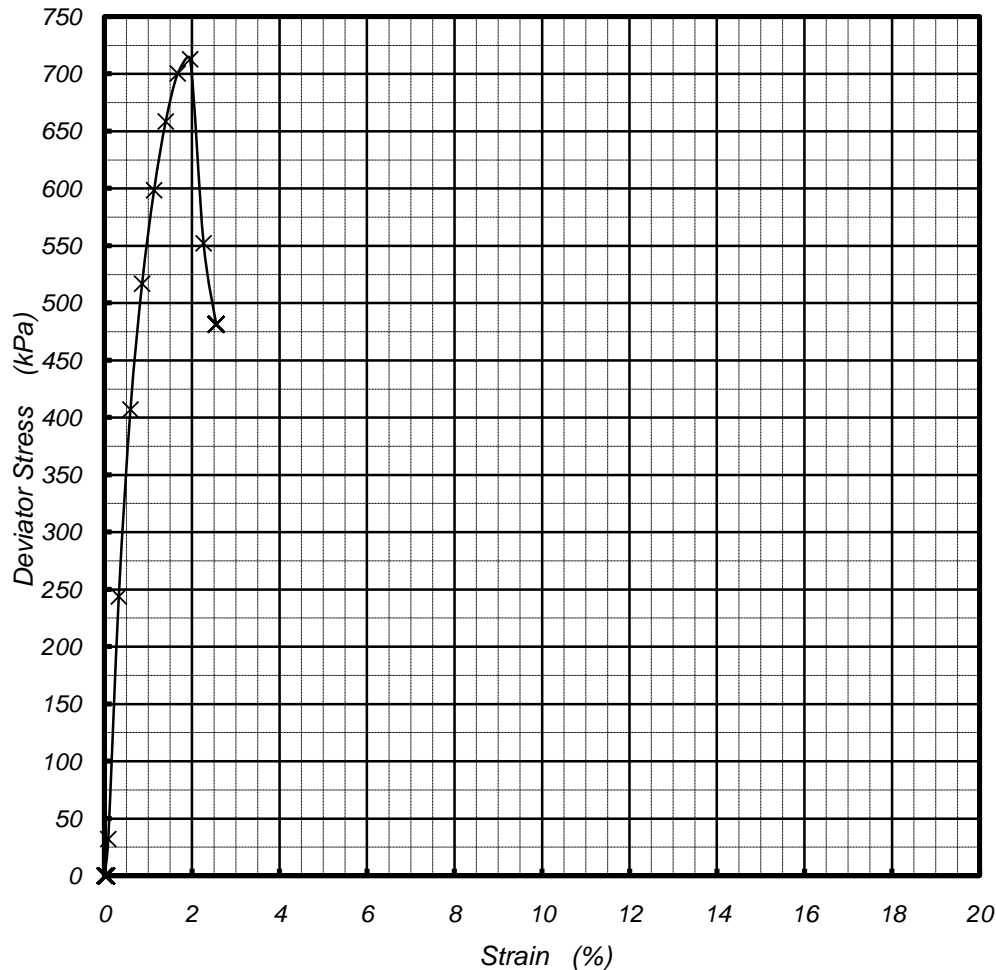
Client	JAC BS S M (M LB R )	Tested by	S
Project	S 79600.002 SDL ADJ STM T PR J CTS	Date tested	27/11/14
Location	A MALL CMA	Checked by	PJF

Sample identification	BCM-BH02 1.5 - 1.75m	Sample No	14443004
Type of sample	63	Sampling date	2014
Type of test	Unconsolidated undrained single stage triaxial without pore pressure measurements.		
Sample description	CLA high plasticit pale gre		
Mode of failure	Shear failure at 50 degrees to hori ontal a is		

Test Stage	Cell Pressure (kPa)	Deviator Stress at failure (kPa)	Strain at failure (%)	Rate of strain (mm/min)
1	30	713	2.0	1.13

Sample dry density	D /0 t/m <sup>3</sup>	Height of sample	127.2 mm
Sample moisture content	D /0 %	Diameter of sample	63.3 mm

STRESS - STRAIN PLOT



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry



# TRIAXIAL TEST

AS 1289.6.4.1

Job No 14443  
 Report No 14443/R011  
 Issue date 04/12/14

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

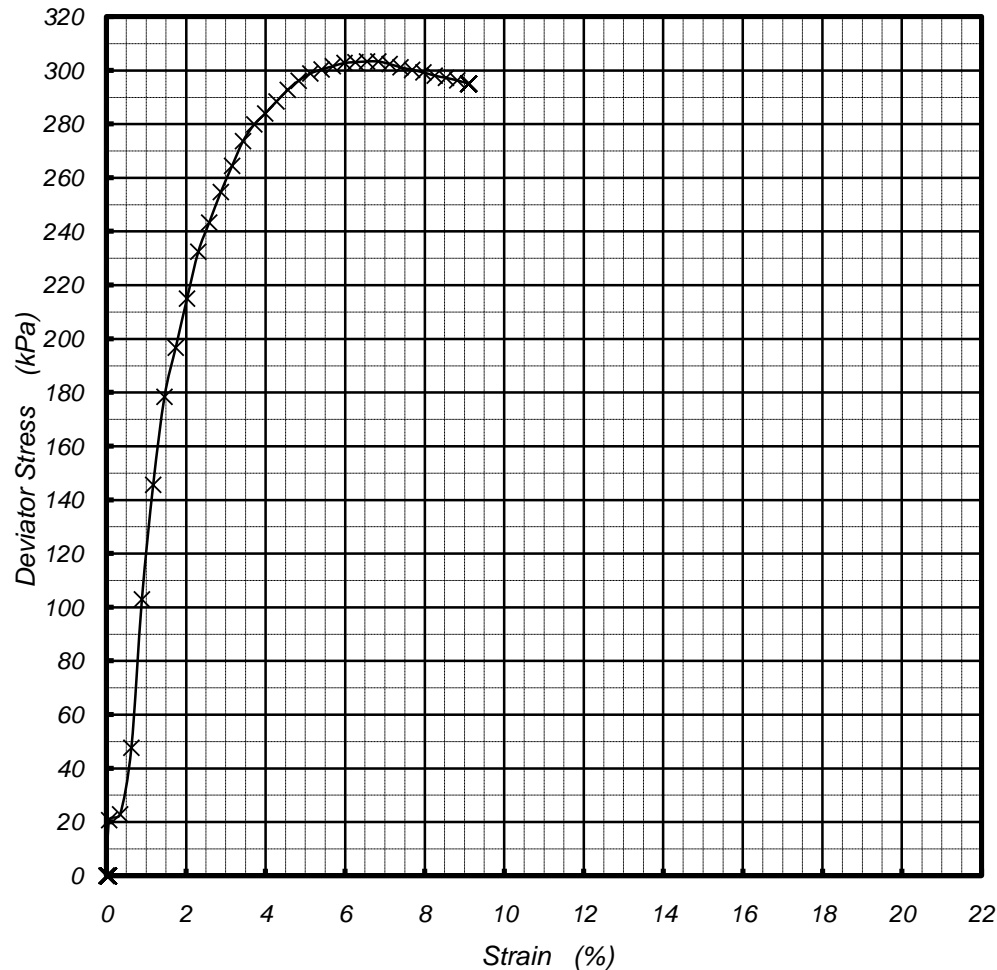
Client	JAC B S S M (M L B R )	Tested by	S
Project	S 79600.002 SDL ADJ STM T PR J CTS	Date tested	27/11/14
Location	A MALL CMA	Checked by	PJF

Sample identification	-BH01 1.9 - 2.15m	Sample No	14443006
Type of sample	63	Sampling date	2014
Type of test	Unconsolidated undrained single stage triaxial without pore pressure measurements.		
Sample description	CLA high plasticit pale gre and orange / brown		
Mode of failure	Shear failure at 45 degrees to hori ontal a is		

Test Stage	Cell Pressure (kPa)	Deviator Stress at failure (kPa)	Strain at failure (%)	Rate of strain (mm/min)
1	40	303	6.6	1.13

Sample dry density	1.59 t/m <sup>3</sup>	Height of sample	127.1 mm
Sample moisture content	23.4 %	Diameter of sample	63.1 mm

### STRESS - STRAIN PLOT



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry





# TRIAXIAL TEST

AS 1289.6.4.1

Job No 14443  
 Report No 14443/R012  
 Issue date 04/12/14

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

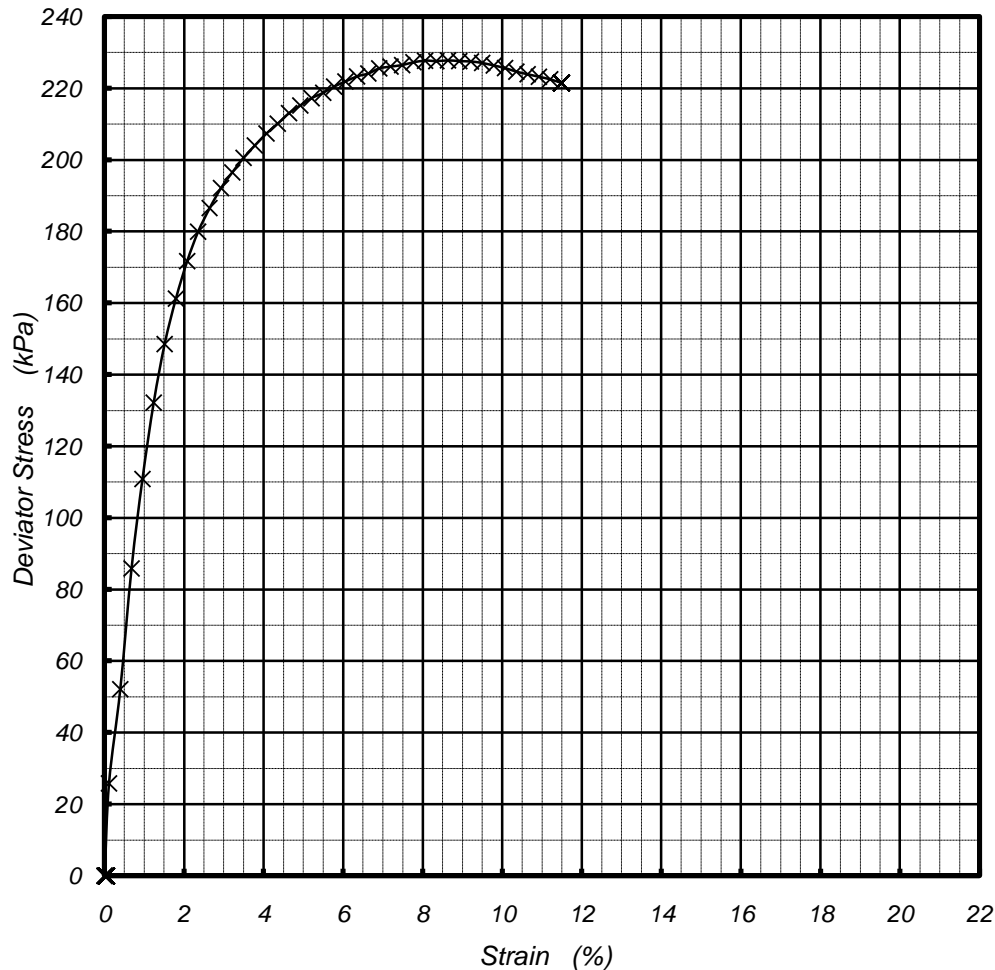
Client	JAC BS S M (M LB R )	Tested by	S
Project	S 79600.002 SDL ADJ STM T PR J CTS	Date tested	27/11/14
Location	A MALL CMA	Checked by	PJF

Sample identification	-BH01 4.3 - 4.7m	Sample No	14443007
Type of sample	63	Sampling date	2014
Type of test	Unconsolidated undrained single stage triaxial without pore pressure measurements.		
Sample description	CLA low plasticit orange / brown and gre trace of fine to coarse sand		
Mode of failure	Shear failure at 40 degrees to hori ontal a is		

Test Stage	Cell Pressure (kPa)	Deviator Stress at failure (kPa)	Strain at failure (%)	Rate of strain (mm/min)
1	90	228	8.6	1.13

Sample dry density	1.72 t/m <sup>3</sup>	Height of sample	126.7 mm
Sample moisture content	18.4 %	Diameter of sample	63.2 mm

### STRESS - STRAIN PLOT



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry



# TRIAXIAL TEST

AS 1289.6.4.1

Job No 14443  
 Report No 14443/R013  
 Issue date 04/12/14

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

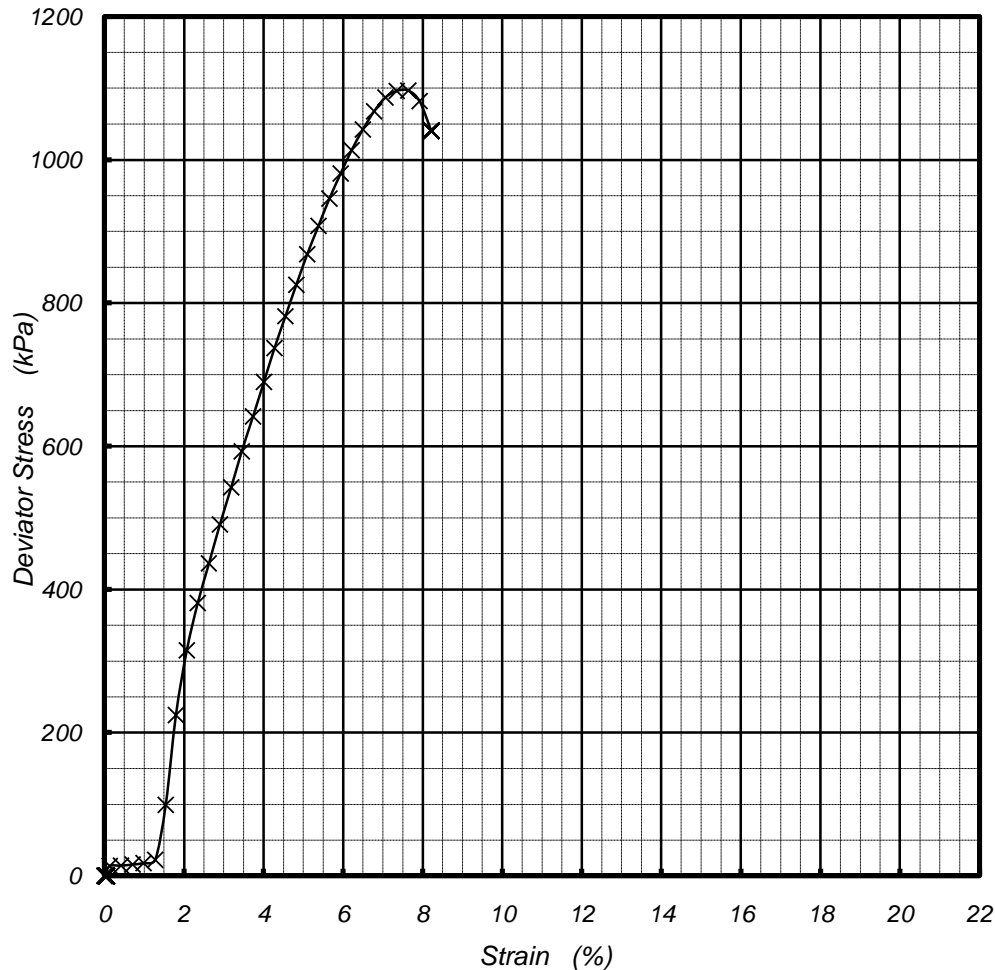
Client	JAC B S M (M L B R )	Tested by	S
Project	S 79600.002 SDL ADJ STM T PR J CTS	Date tested	27/11/14
Location	A MALL CMA	Checked by	PJF

Sample identification	S-BH02 1.5 - 1.9m	Sample No	14443012
Type of sample	63	Sampling date	2014
Type of test	Unconsolidated undrained single stage triaxial without pore pressure measurements.		
Sample description	CLA high plasticit pale gre and brown		
Mode of failure	Shear failure at 50 degrees to hori ontal a is		

Test Stage	Cell Pressure (kPa)	Deviator Stress at failure (kPa)	Strain at failure (%)	Rate of strain (mm/min)
1	30	1097	7.6	1.13

Sample dry density	1.68 t/m <sup>3</sup>	Height of sample	127.2 mm
Sample moisture content	19.9 %	Diameter of sample	62.2 mm

STRESS - STRAIN PLOT



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Peter Fry



# TRIAXIAL TEST

AS 1289.6.4.1

Job No 14443  
 Report No 14443/R014  
 Issue date 09/12/14

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Tested by S  
 Date tested 08/12/14  
 Checked by A R

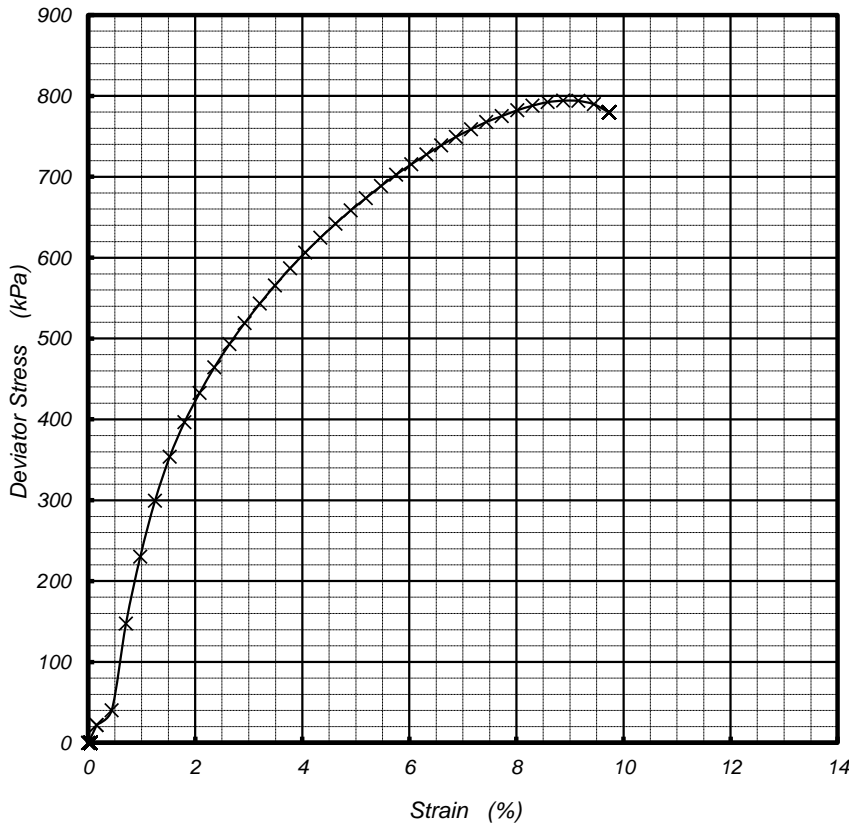
Client JAC B S S M (M L B R )  
 Project S 79600.002 SDL ADJ STM T PR J CTS  
 Location A MALL CMA

Sample identification S-BH03 3.0 - 3.25m  
 Type of sample 63  
 Type of test *Unconsolidated undrained single stage triaxial without pore pressure measurements.*  
 Sample description sand CLA high plasticit pale gre with pale brown trace of fine to coarse sand  
 Mode of failure Shear failure at 60 degrees to hori ontal core a is.

Test Stage	Cell Pressure (kPa)	Deviator Stress at failure (kPa)	Strain at failure (%)	Rate of strain (mm/min)
1	60	794	8.9	1.13

Sample dry density	1.83 t/m <sup>3</sup>	Height of sample	127.2 mm
Sample moisture content	15.6 %	Diameter of sample	61.2 mm

STRESS - STRAIN PLOT



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025 Accreditation No 9909

*Andrew Roberts*

Approved Signatory : Andrew Roberts



# SHRINK SWELL INDEX

AS 1289.7.1.1

Job No 14443  
 Report No 14443/R015  
 Date of Issue 05/12/14

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Tested by S  
 Date tested 02/12/14  
 Checked by PJF

Client	JAC BS S M (M LB R )	Tested by	S
Project	S 79600.002 SDL ADJ STM T PR J CTS	Date tested	02/12/14
Location	A MALL CMA	Checked by	PJF

Sample No	14443003		
Sample identification	BC -BH02 0.7 - 1.1m		
Date sampled	2014		
Sampled by	Client		
Sampling method	B Client		
Sample type	63		
<b>Swell Test</b>			
Moisture content before swell	%	11.4	
Moisture content after swell	%	26.8	
Swell ( $E_{sw}$ )	%	6.9	
<b>Shrinkage Test</b>			
Sample dry density	t/m <sup>3</sup>	1.73	
Sample moisture content	%	13.8	
Shrinkage ( $E_{sh}$ )	%	1.5	
<b>Shrink Swell Index (<math>I_{ss}</math>)</b>		<b>2.7</b>	
Sample description	CLA medium plasticit light gre and brown trace of fine sand		
Comments	Cracks developed in shrinkage specimen		

A711 V1.3 APR 11



This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025

Accreditation No 9909

Approved Signatory: Peter Fry





# SHRINK SWELL INDEX

AS 1289.7.1.1

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Job No 14443  
Report No 14443/R016  
Date of Issue 09/12/14

Client	JAC B S M (M L B R )	Tested by	S
Project	S 79600.002 SDL ADJ STM T PR J CTS	Date tested	05-08/12/14
Location	A MALL CMA	Checked by	A R
<b>Sample No</b>		14443013	
<b>Sample identification</b>		S-BH03 0.8 - 1.25m	
<b>Date sampled</b>		2014	
<b>Sampled by</b>		Client	
<b>Sampling method</b>		B Client	
<b>Sample type</b>		63	
<b>Swell Test</b>			
Moisture content before swell	%	18.6	
Moisture content after swell	%	23.6	
Swell ( $E_{sw}$ )	%	2.6	
<b>Shrinkage Test</b>			
Sample dry density	t/m <sup>3</sup>	1.63	
Sample moisture content	%	16.4	
Shrinkage ( $E_{sh}$ )	%	1.3	
<b>Shrink Swell Index (<math>I_{ss}</math>)</b>		<b>1.4</b>	
<b>Sample description</b>		CLA medium plasticity dark grey-brown and white.	
<b>Comments</b>		<p>Minor cracking in shrinkage core.</p> <p>1 horizontal &lt;0.5mm and 1 vertical &lt;0.5mm</p>	



This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025

Accreditation No 9909

A/11 V1.3 APR 11

Approved Signatory: Peter Fry



# CONSTANT HEAD PERMEABILITY TEST

AS 1289.6.7.3

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Job No 14443  
Report No 14443/R017  
Date of Issue 05/12/14

Client JAC BS S M (M LB R )  
Project S 79600.002 SDL ADJ STM T PR J CTS  
Location A MALL CMA

Tested by A R  
Date tested 01/12/14  
Checked by PJF

Sample No	14443001
Sample identification	BC -BH01 1.3 - 1.65m
Date sampled	2014
Sampled by	Client
Sampling method	B Client
Sample type	63

### Specimen details before test

Length of specimen	mm	64.3
Diameter of specimen	mm	60.6
Length to diameter ratio		1: 0.9
Dry density	t/m <sup>3</sup>	1.90
Moisture content	%	13.0

### Specimen details after test

Moisture content	%	18.0
Mean effective stress	kPa	100
Permeant used		Distilled water

**PERMEABILITY ( k )** m/sec 4 -11

### Sample description

sand CLA medium plasticit pale gre  
with fine sand and fine to medium gravel

A673U2 V1.4 MAR 13



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025 Accreditation No 9909

Approved Signatory : Peter Fry



# CONSTANT HEAD PERMEABILITY TEST

AS 1289.6.7.3

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Job No 14443  
Report No 14443/R018  
Date of Issue 05/12/14

Client JAC BS S M (M LB R )  
Project S 79600.002 SDL ADJ STM T PR J CTS  
Location A MALL CMA

Tested by A R  
Date tested 01/12/14  
Checked by PJF

Sample No	14443006
Sample identification	-BH01 1.9 - 2.15m
Date sampled	2014
Sampled by	Client
Sampling method	B Client
Sample type	63

### Specimen details before test

Length of specimen	mm	64.2
Diameter of specimen	mm	63.4
Length to diameter ratio		1: 1.0
Dry density	t/m <sup>3</sup>	1.56
Moisture content	%	25.0

### Specimen details after test

Moisture content	%	26.7
Mean effective stress	kPa	100
Permeant used		Distilled water

<b>PERMEABILITY ( k )</b>	m/sec	7 -11
---------------------------	-------	-------

Sample description	CLA high plasticit pale gre and orange / brown
--------------------	--

A673U2 V1.4 MAR 13



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025 Accreditation No 9909

Approved Signatory : Peter Fry



# CONSTANT HEAD PERMEABILITY TEST

AS 1289.6.7.3

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Job No 14443  
Report No 14443/R019  
Date of Issue 09/12/14

Client	JAC BS S M (M LB R )	Tested by	A R
Project	S 79600.002 SDL ADJ STM T PR J CTS	Date tested	04-08/12/14
Location	A MALL CMA	Checked by	A R
<b>Sample No</b> 14443009			
<b>Sample identification</b> -BH01 1.8 - 2.1m			
<b>Date sampled</b> 2014			
<b>Sampled by</b> Client			
<b>Sampling method</b> B Client			
<b>Sample type</b> 63			
<b>Specimen details before test</b>			
Length of specimen	mm	63.8	
Diameter of specimen	mm	63.4	
Length to diameter ratio		1: 1.0	
Dry density	t/m <sup>3</sup>	1.79	
Moisture content	%	17.8	
<b>Specimen details after test</b>			
Moisture content	%	20.9	
Mean effective stress	kPa	100	
Permeant used		Distilled water	
<b>PERMEABILITY ( k )</b> m/sec 2 10 <sup>-11</sup>			
<b>Sample description</b> CLA high plasticity dark grey / grey with brown			



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025 Accreditation No 9909

Approved Signatory : Andrew Roberts

A67302 V1.3 OCT 09





# CONSTANT HEAD PERMEABILITY TEST

AS 1289.6.7.3

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Job No 14443  
Report No 14443/R020  
Date of Issue 09/12/14

Client	JAC BS S M (M LB R )	Tested by	A R
Project	S 79600.002 SDL ADJ STM T PR J CTS	Date tested	04-08/12/14
Location	A MALL CMA	Checked by	A R
<b>Sample No</b> 14443011			
<b>Sample identification</b> S-BH01 4.0 - 4.45m			
<b>Date sampled</b> 2014			
<b>Sampled by</b> Client			
<b>Sampling method</b> B Client			
<b>Sample type</b> 63			
<b>Specimen details before test</b>			
Length of specimen	mm	64.7	
Diameter of specimen	mm	62.3	
Length to diameter ratio		1: 1.0	
Dry density	t/m <sup>3</sup>	1.82	
Moisture content	%	14.0	
<b>Specimen details after test</b>			
Moisture content	%	19.5	
Mean effective stress	kPa	100	
Permeant used		Distilled water	
<b>PERMEABILITY ( k )</b> m/sec 3 10 <sup>-11</sup>			
<b>Sample description</b>			
sand CLA medium plasticity dark grey and brown fine to medium sand			



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

Approved Signatory : Andrew Roberts

A67302 V1.3 OCT 09



# CONSTANT HEAD PERMEABILITY TEST

AS 1289.6.7.3

Job No 14443  
Report No 14443/R021  
Date of Issue 09/12/14

## CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Client	JAC BS S M (M LB R )	Tested by	A R
Project	S 79600.002 SDL ADJ STM T PR J CTS	Date tested	04-/08/12/14
Location	A MALL CMA	Checked by	A R

Sample No	14443013
Sample identification	S-BH03 0.8 - 1.25m
Date sampled	2014
Sampled by	Client
Sampling method	B Client
Sample type	63

### Specimen details before test

Length of specimen	mm	64.2
Diameter of specimen	mm	63.2
Length to diameter ratio		1: 1.0
Dry density	t/m <sup>3</sup>	1.76
Moisture content	%	16.3

### Specimen details after test

Moisture content	%	22.0
Mean effective stress	kPa	100
Permeant used		Distilled water

<b>PERMEABILITY ( k )</b>	m/sec	2 10 <sup>-10</sup>
---------------------------	-------	---------------------

Sample description	CLA medium plasticity dark grey-brown and white. Sand lenses running vertically through sample.
--------------------	--



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025  
Accreditation No 9909

Approved Signatory : Andrew Roberts

A67302 V1.3 OCT 09



## TEST RESULTS

AS 1289.2.1.1 3.1.2 3.2.1 3.3.1 3.4.1 3.6.1 3.8.1

Job No 14443  
 Report No 14443/R022  
 Date of Issue 09/12/14

**CIVIL GEOTECHNICAL SERVICES**  
 6 - 8 Rose Avenue, Croydon 3136

Client JAC BS S M (M LB R )  
 Project S 79600.002 SDL ADJ STM T PR J CTS  
 Location A MALL CMA

Tested by S IA R  
 Date tested 27/11-9/12/14  
 Checked by A R

Sample Identification	Soil Description	Field Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Linear Shrinkage %	% Passing 75µm sieve	Emerson Class No*
14443001 BC -BH01 1.3 - 1.65m	sand CLA medium plasticit pale gre with fine sand and fine to medium gravel	13.0	36	14	22	11.0	62	2
14443002 BC -BH01 4.9m	sand CLA low plasticit light gre with orange-brown fine to medium sand	18.5	33	14	19	9.0	69	-
14443003 BC -BH02 0.7 - 1.1m	CLA medium plasticit light gre with brown trace of fine to medium sand	11.8	41	15	26	11.5	89	-
14443004 BCM-BH02 1.5 - 1.75m	CLA high plasticit pale gre	19.2	62	19	43	18.0	94	2
14443005 BCS-BH01 6.0 - 6.2m	CLA medium plasticit pale brown / gre and orange-brown with fine to medium sand	15.5	37	14	23	9.5	76	-
14443006 -BH01 1.9 - 2.15m	CLA high plasticit pale gre and orange / brown	23.4	50	19	31	14.0	98	3
14443007 -BH01 1 4.3 - 4.7m	CLA low plasticit orange / brown and gre trace of fine to coarse sand	18.4	-	-	-	-	-	-
14443008 S-BH01 1.5m	sand CLA low plasticit brown fine to medium sand	8.4	30	14	16	7.5	70	-

**Notes**

AS 1289.3.1.2,3.2.1,3.4.1 Method of drying: ven dried AS 1289.3.8.1\* Water used: Distilled water  
 Dry/Wet sieve: Dr Temperature: 20.5 °C  
 Curing time: >24hrs Date sampled: 2014



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

*Andrew Roberts*

Approved Signatory : Andrew Roberts



## TEST RESULTS

AS 1289.2.1.1 3.1.2 3.2.1 3.3.1 3.4.1 3.6.1 3.8.1

Job No 14443  
 Report No 14443/R023  
 Date of Issue 09/12/14

**CIVIL GEOTECHNICAL SERVICES**

6 - 8 Rose Avenue, Croydon 3136

Client JAC BS S M (M LB R ) Project S 79600.002 SDL ADJ STM T PR J CTS Location A MALL CMA	Tested by S I A R Date tested 27/11-8/12/14 Checked by A R
--	--

Sample Identification	Soil Description	Field Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Linear Shrinkage %	% Passing 75µm sieve	Emerson Class No*
14443010 S-BH01 3.5m	clay e SA D fine to coarse dark brown fines of low plasticit	5.9	23	14	9	4.5	32	4
14443011 S-BH01 4.0 - 4.45m	sand CLA medium plasticit dark gre and brown fine to medium sand	14.6	47	17	30	13.0	58	-
14443012 S-BH02 1.5 - 1.9m	CLA high plasticit pale gre and brown	19.9	57	21	36	12.5	96	2
14443013 S-BH03 0.8 - 1.25m	CLA medium plasticit dark gre -brown and white trace of fine sand.	16.3	44	16	28	11.5	-	-

**Notes**

AS 1289.3.1.2,3.2.1,3.4.1 Method of drying: oven dried Dry/Wet sieve: Dr Curing time: >24hrs	AS 1289.3.8.1* Water used: Distilled water Temperature: 20.5 °C Date sampled: 2014
--	--



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards. Accredited for compliance to ISO/IEC 17025. Accreditation No 9909

*Andrew Roberts*

Approved Signatory : Andrew Roberts





## TEST RESULTS

AS 1289.2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1, 3.6.1, 3.8.1 & 6.4.1 (Clauses 4 and 5a)

Job No 14443

Report No 14443/R022

Date of Issue

### CIVIL GEOTECHNICAL SERVICES

6 - 8 Rose Avenue, Croydon 3136

Client JACOBS SKM (MELBOURNE)	Tested by
Project ISO79600.002 SDL ADJUSTMENT PROJECTS	Date tested
Location VIA MALLEE CMA	Checked by XXXX

Sample Identification	Soil Description	Field Moisture Content %	Dry Density t/m <sup>3</sup>	Liquid Limit %	Plastic Limit %	Plasticity Index %	Linear Shrinkage %	% Passing 75µm sieve	Emerson Class No*	Emerson Class No**
14443001 BCN-BH01 1.3 - 1.65m	sandy CLAY, medium plasticity, pale grey, with fine sand and fine to medium gravel	14.1	-	36	14	22	11.0	62	2	3
14443002 BCN-BH01 @ 4.9m	sandy CLAY, low plasticity, light grey with orange-brown, fine to medium sand	18.5	-	33	14	19	9.0	69	-	-
14443003 BCN-BH02 0.7 - 1.1m	□□CLAY, medium plasticity, light grey with trace of fine to medium sand san	11.8	-	41	15	26	-	89	-	-
14443004 BCM-BH02 1.5 - 1.75m	CLAY, high plasticity, pale grey	-	-	62	19	43	18.0	94	2	6
14443005 BCS-BH01 6.0 - 6.2m	CLAY, medium plasticity, pale brown / grey and orange-brown, with fine to medium sand	15.5	-	37	14	23	9.5	76	-	-
14443006 NN-BH01 1.9 - 2.15m	CLAY, high plasticity, pale grey and orange / brown	-	-	50	19	31	14.0	98	3	5
14443007 NN-BH01 4.3 - 4.7m	CLAY, low plasticity, orange / brown and grey, trace of fine to coarse sand	-	-	-	-	-	-	-	-	-
14443008 NS-BH01 @ 1.5m	sandy CLAY, low plasticity, brown, fine to medium sand	8.4	-	30	14	16	7.5	70	-	-
14443009 VN-BH01 1.8 - 2.1m	CLAY, high plasticity, dark grey / grey with brown	-	-	-	-	-	-	-	-	-

**Notes**

AS 1289.3.1.2,3.2.1,3.4.1	Method of drying: Air dried	AS 1289.3.8.1	Water used: * Distilled water	** River water
	Dry/Wet sieve: Dry		Temperature: 20.5 °C	20.7 - 20.7 °C
	Curing time: >24hrs		Date sampled: 2014	2014

## Moisture Content Report

Client :	Jacobs	Report Number:	3160187 - 2
Address :	Level 11, 462 Flinders Street, MELBOURNE, VIC, 3000	Report Date :	10/08/2016
Project Name :	Regulator Structures	Order Number :	
Project Number :	3160187	Test Method :	AS1289.2.1.1
Location:	Nyah, Burra Creek, Vinifera, Vinifera Sth & Burra B1 , Vic	Page 1 of 1	

Sample Number :	163-2187	163-2191	163-2192	163-2193
Test Number :	2	6	7	8
Sampling Method :	AS1289.1.2.1(6.5.3)	AS1289.1.2.1(6.5.3)	AS1289.1.2.1(6.5.4)	AS1289.1.2.1(6.5.4)
Date Sampled :	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date Tested :	20/07/2016	20/07/2016	20/07/2016	20/07/2016
Material Type :	Insitu	Insitu	Insitu	Insitu
Material Source :	Site Derived	Site Derived	Site Derived	Site Derived
Sample Location :	Refer To Plan BCN - BH03  1.0 - 1.45 Metres	Refer To Plan NN - BH02  1.0 - 1.45 Metres	Refer To Plan VS - TP07  0.7 - 1.3 Metres	Refer To Plan VS - TP12  0.6 - 1.5 Metres
Oven Temperature (°C) :	105-110	105-110	105-110	105-110
Soil Description :	CLAY	CLAY	CLAY	CLAY
Moisture Content (%) :	19.3	10.4	15.4	18.0

Sample Number :				
Test Number :				
Sampling Method :				
Date Sampled :				
Date Tested :				
Material Type :				
Material Source :				
Sample Location :				
Oven Temperature (°C) :				
Soil Description :				
Moisture Content (%) :				
Remarks :				



Accredited for compliance with ISO/IEC 17025.

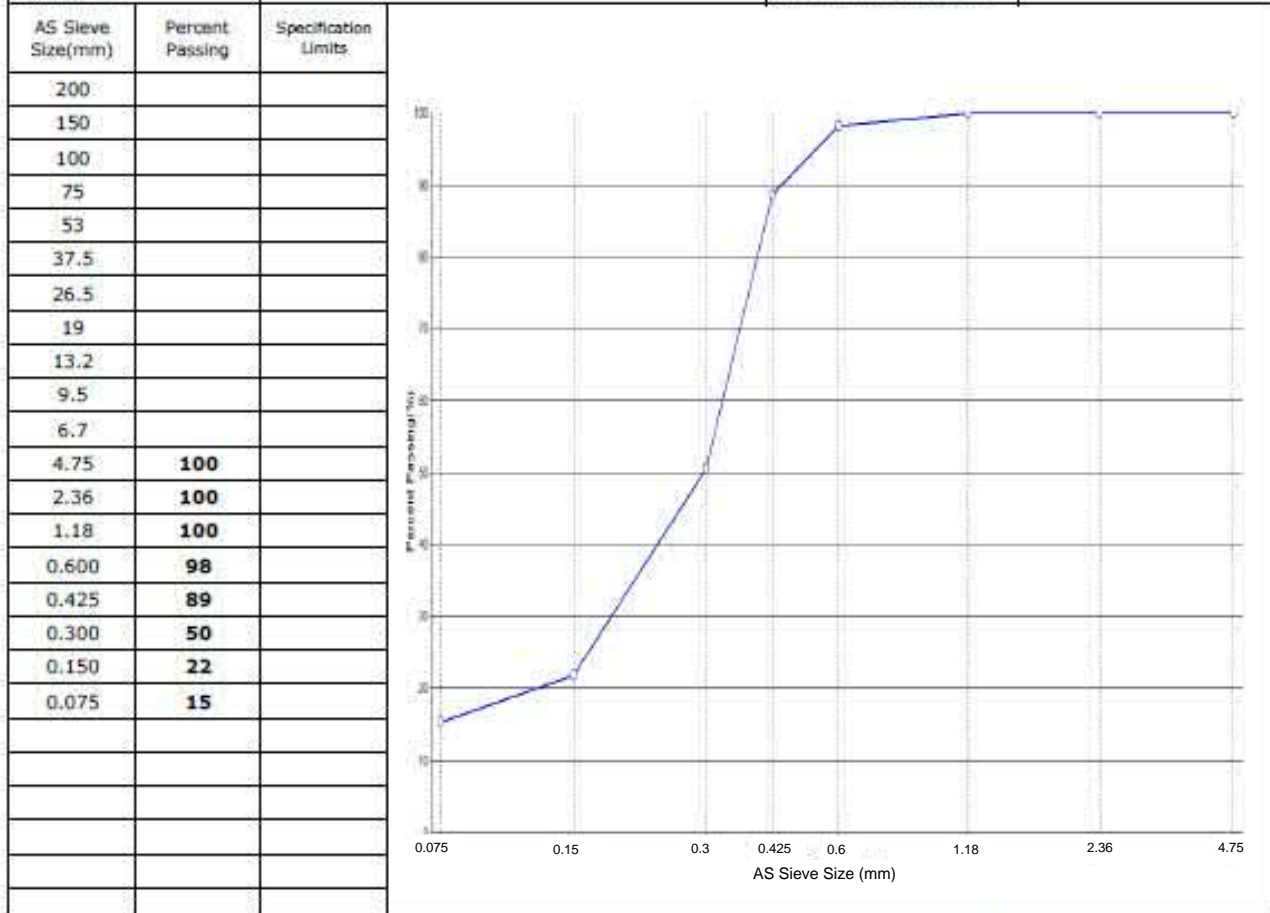
APPROVED SIGNATORY


*(Signature)*  
 Ryan Smith - Senior Lab Technician  
 NATA Accreditation Number  
 10784

## Particle Size Distribution Report

Client :	<b>Jacobs</b>	Report Number:	<b>3160187 - 3</b>
Address :	<b>Level 11, 462 Flinders Street, MELBOURNE, VIC, 3000</b>	Report Date :	<b>10/08/2016</b>
Project Name :	<b>Regulator Structures</b>	Order Number :	
Project Number :	<b>3160187</b>	Test Method :	<b>AS1289.3.6.1</b>
Location:	<b>Nyah, Burra Creek, Vinifera, Vinifera Sth &amp; Burra B1</b>	<b>Page 1 of 2</b>	

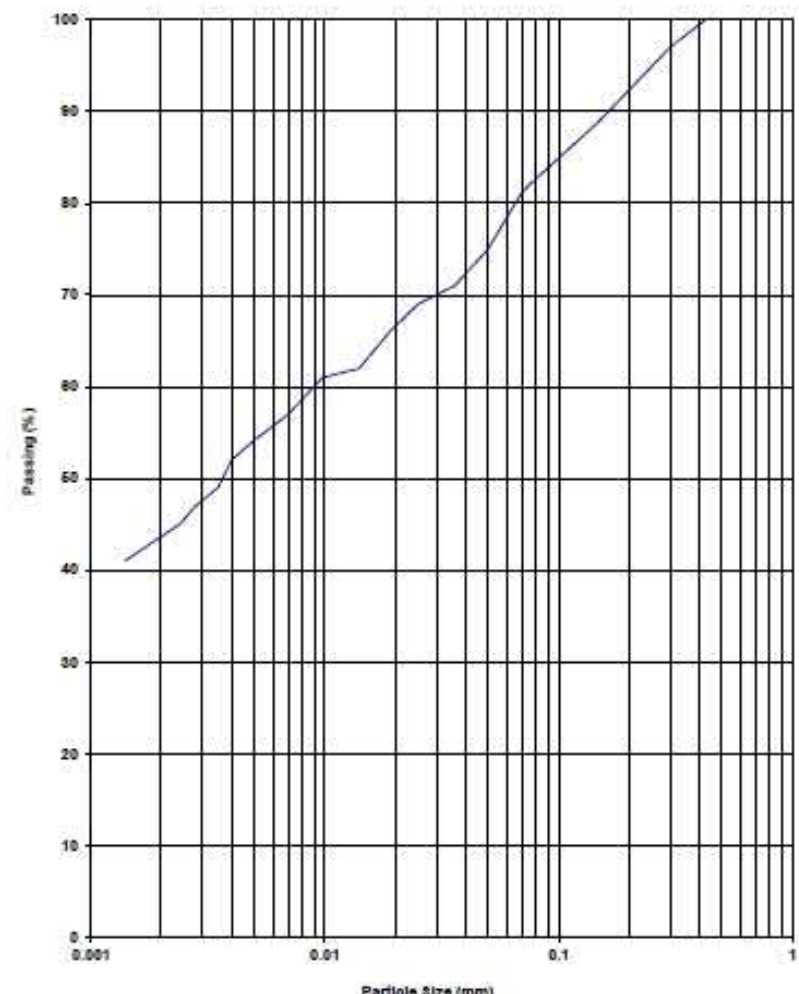
Sample Number :	163-2189	SAMPLE LOCATION	
Sampling Method :	AS1289.1.2.1(6.5.3)	Refer To Plan	
Sampled By :	Ryan Smith	<b>BCN - BH03</b>	
Date Sampled :	22/06/2016	<b>4.5 - 4.95 Metres</b>	
Date Tested :	25/07/2016	Test Number :	<b>4</b>
Material Type :	Insitu	Lot Number :	<b>-</b>
Material Source :	Site Derived	Specification Number :	
Remarks :			



 <p><b>NATA</b> NATIONAL METROLOGY ACCREDITATION</p>	<p>Accredited for compliance with ISO/IEC 17025.</p>	<p><b>APPROVED SIGNATORY</b></p>  <p>Ryan Smith - Senior Lab Technician                  NATA Accreditation Number                  10784</p>
	<p>Document Code: RP141-14</p>	





<b>PARTICLE SIZE DISTRIBUTION TEST REPORT</b>			
Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1			
<b>Client</b>	Civiltest Pty Ltd	<b>Report No.</b>	16070533-G
<b>Address</b>	PO Box 537 MORNINGTON VIC 3931	<b>Test Date</b>	28/7/16-3/8/16
		<b>Report Date</b>	3/8/2016
<b>Project</b>	3160187-4 - MCMA - SDL Project - Location: Victoria		
<b>Client ID</b>	BCN-BH3 - 163-2187	<b>Depth (m)</b>	1.00-1.45
<b>Sieve Size (mm)</b>	<b>Passing %</b>		
150.0			
75.0			
63.0			
53.0			
37.5			
26.5			
19.0			
13.2			
9.5			
6.7			
4.75			
2.36			
1.18			
0.600			
0.425	100		
0.300	97		
0.150	89		
0.075	82		
0.069	81		
0.05	75		
0.036	71		
0.025	69		
0.019	66		
0.014	62		
0.0098	61		
0.007	57		
0.0049	54		
0.004	52		
0.0035	49		
0.0028	47		
0.0024	45		
0.0014	41		
<b>NOTES/REMARKS:</b>			
Moisture Content 15.5%      -2.36mm Soil Particle Density(t/m <sup>3</sup> ) 2.51 Sample/s supplied by the client			

Accredited for compliance with ISO/IEC 17025.  
The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards.

Tested at Trilab Brisbane Laboratory.

Authorized Signatory  
  
C. Channon



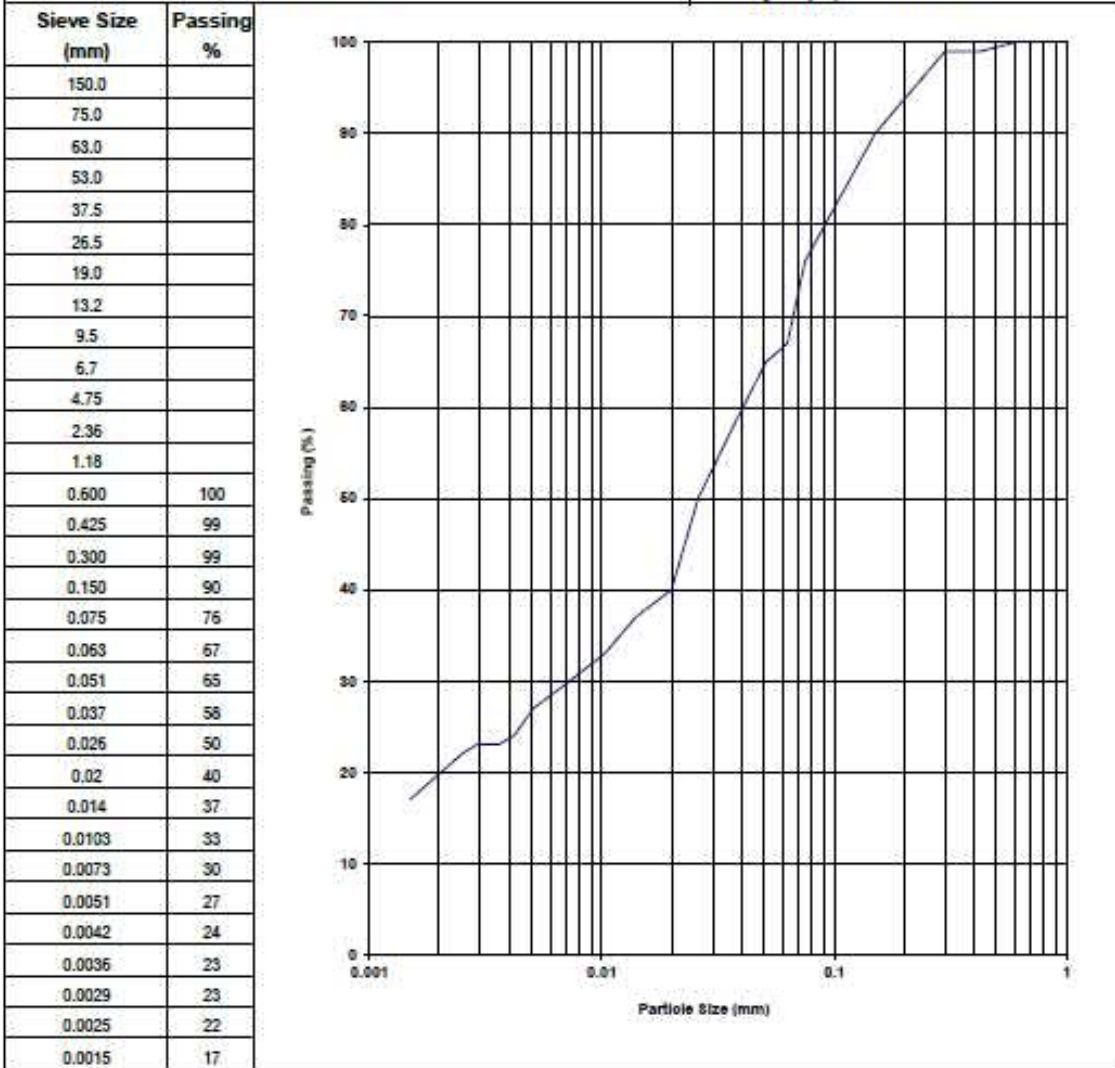
Laboratory No. 5926

The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated.  
Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details.  
Trilab Pty Ltd ABN 25 065 630 505

### PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

<b>Client</b> Civiltest Pty Ltd	<b>Report No.</b> 16070534-G
<b>Address</b> PO Box 537 MORNINGTON VIC 3931	<b>Test Date</b> 28/7/16-2/8/16
	<b>Report Date</b> 2/8/2016
<b>Project</b> 3160187-4 - MCMA - SDL Project - Location: Victoria	
<b>Client ID</b> BCN-BH3 - 163-2188	<b>Depth (m)</b> 3.00-3.45



**NOTES/REMARKS:**  
 Moisture Content 16.8%      -2.36mm Soil Particle Density(t/m<sup>3</sup>) 2.58  
 Sample/s supplied by the client

Accredited for compliance with ISO/IEC 17025.  
 The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards.

Authorized Signatory  
  
 C. Channon



Tested at Trilab Brisbane Laboratory.

Laboratory No. 9926

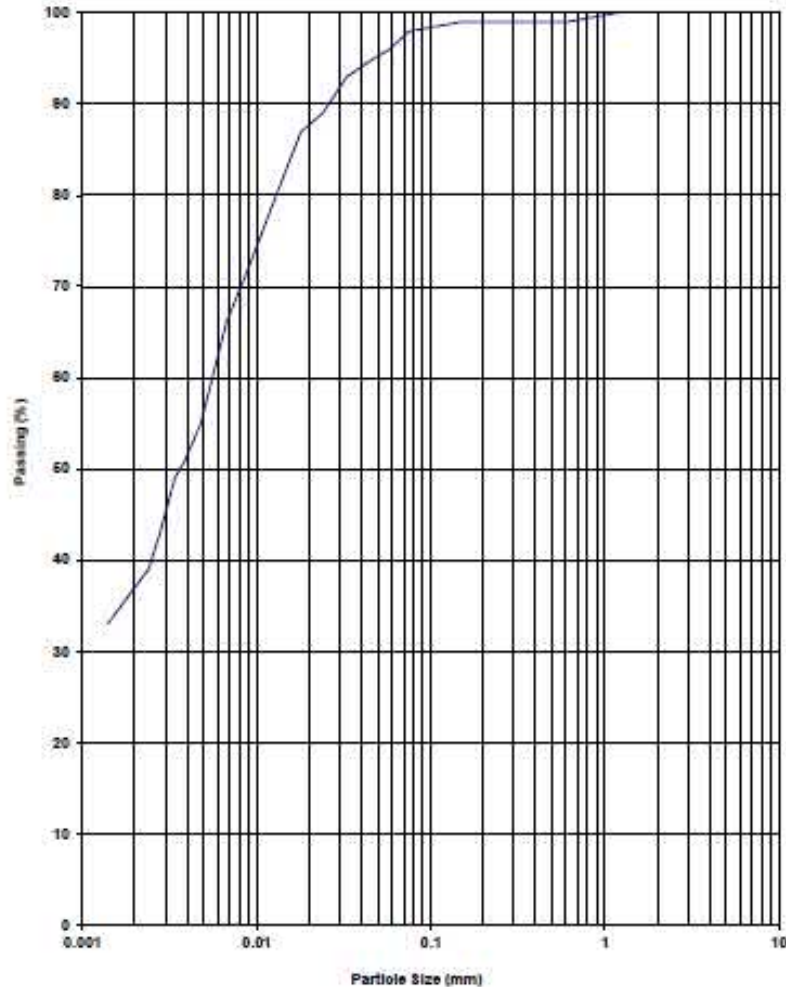
The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated.  
 Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details.  
 Trilab Pty Ltd    ABN 25 065 630 506

**PARTICLE SIZE DISTRIBUTION TEST REPORT**

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

Client	Civiltest Pty Ltd	Report No.	16070535-G
Address	PO Box 537 MORNINGTON VIC 3931	Test Date	28/7/16-3/8/16
		Report Date	3/8/2016
Project	3160187-4 - MCMA - SDL Project - Location: Victoria		
Client ID	BCN-BH3 - 163-2190	Depth (m)	6.00-6.45

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
13.2	
9.5	
6.7	
4.75	
2.36	
1.18	100
0.600	99
0.425	99
0.300	99
0.150	99
0.075	98
0.058	96
0.047	95
0.033	93
0.024	89
0.018	87
0.013	80
0.0094	73
0.0067	66
0.0048	55
0.0039	51
0.0034	49
0.0028	43
0.0024	39
0.0014	33



**NOTES/REMARKS:**

Moisture Content 20.3%      -2.38mm Soil Particle Density( $t/m^3$ ) 2.58  
Sample/s supplied by the client

Accredited for compliance with ISO/IEC 17025.  
The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards.

Tested at Trilab Brisbane Laboratory.

Authorized Signatory



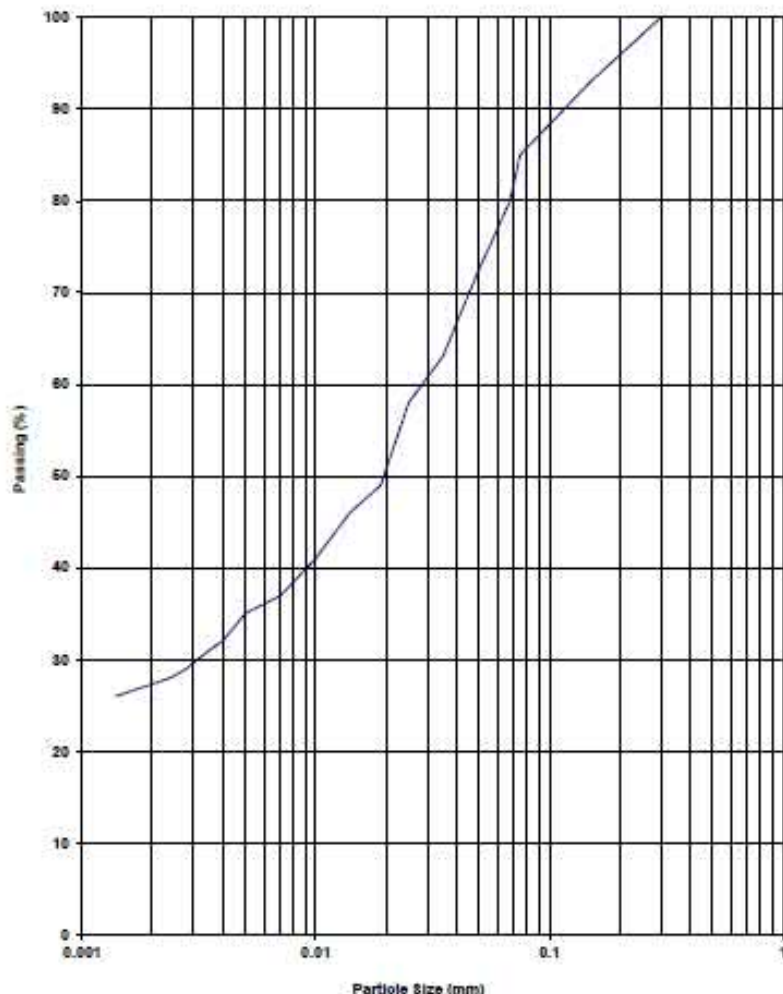
C. Channon



Laboratory No. 9926

The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated.  
Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details.  
Trilab Pty Ltd ABN 25 065 630 505



<b>PARTICLE SIZE DISTRIBUTION TEST REPORT</b>			
Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1			
Client	Civiltest Pty Ltd	Report No.	16070536-G
Address	PO Box 537 MORNINGTON VIC 3931	Test Date	28/7/16-2/8/16
		Report Date	2/8/2016
Project	3160187-4 - MCMA - SDL Project - Location: Victoria		
Client ID	NN-BH2 - 163-2191	Depth (m)	1.00-1.45
<b>Sieve Size (mm)</b>	<b>Passing %</b>		
150.0			
75.0			
63.0			
53.0			
37.5			
26.5			
19.0			
13.2			
9.5			
6.7			
4.75			
2.36			
1.18			
0.600			
0.425			
0.300	100		
0.150	93		
0.075	85		
0.068	80		
0.049	72		
0.035	63		
0.025	58		
0.019	49		
0.014	46		
0.01	41		
0.0071	37		
0.005	35		
0.004	32		
0.0035	31		
0.0028	29		
0.0024	28		
0.0014	26		
<b>NOTES/REMARKS:</b>			
		Moisture Content 10.3%      -2.36mm Soil Particle Density( $\text{t/m}^3$ ) 2.54	
		Sample/s supplied by the client	

Accredited for compliance with ISO/IEC 17025.  
The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards.

Tested at Trilab Brisbane Laboratory.

Authorized Signatory



C. Channon



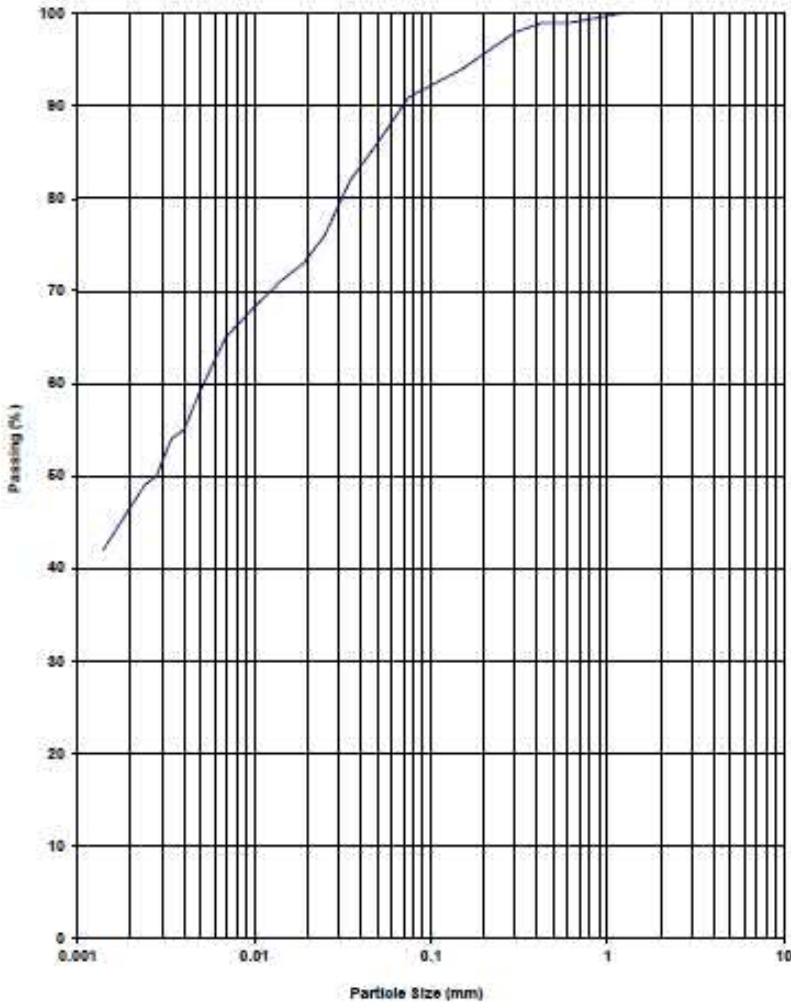
Laboratory No. 9926

The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated.

Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details.

Trilab Pty Ltd    ABN 25 065 630 506



PARTICLE SIZE DISTRIBUTION TEST REPORT			
Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1			
Client	Civiltest Pty Ltd	Report No.	16070537-G
Address	PO Box 537 MORNINGTON VIC 3931	Test Date	28/7/16-3/8/16
		Report Date	3/8/2016
Project	3160187-4 - MCMA - SDL Project - Location: Victoria		
Client ID	VS-TP7 - 163-2192	Depth (m)	0.70-1.30
Sieve Size (mm)	Passing %		
150.0			
75.0			
63.0			
53.0			
37.5			
26.5			
19.0			
13.2			
9.5			
6.7			
4.75			
2.36			
1.18	100		
0.600	99		
0.425	99		
0.300	98		
0.150	94		
0.075	91		
0.064	89		
0.05	86		
0.035	82		
0.025	76		
0.019	73		
0.014	71		
0.0097	68		
0.0069	65		
0.0049	59		
0.004	55		
0.0034	54		
0.0028	50		
0.0024	49		
0.0014	42		
<b>NOTES/REMARKS:</b>			
		Moisture Content 16.5%      -2.36mm Soil Particle Density(t/m <sup>3</sup> ) 2.48	
		Sample/s supplied by the client	
Page 1 of 1    REP03903			

Accredited for compliance with ISO/IEC 17025.  
The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards.

Tested at Trilab Brisbane Laboratory.

Authorized Signatory



C. Channon



Laboratory No. 9926

The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated.  
Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details.

Trilab Pty Ltd    ABN 25 065 630 506

## Atterberg Limits Report

Client :	Jacobs	Report Number:	3160187 - 5
Address :	Level 11, 462 Flinders Street, MELBOURNE, VIC, 3000	Report Date :	10/08/2016
Project Name :	Regulator Structures	Order Number :	
Project Number :	3160187	Test Method :	AS1289.3.1.2, 3.2.1, 3.3.1, 3.4.1
Location:	Nyah, Burra Creek, Vinifera, Vinifera Sth & Burra B1,	Page 1 of 1	

Sample Number :	163-2187	163-2191	163-2192	163-2193
Test Number :	2	6	7	8
Date Sampled :	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date Tested :	2/08/2016	2/08/2016	2/08/2016	2/08/2016
Sampled By :	Ryan Smith	Ryan Smith	Ryan Smith	Ryan Smith
Sampling Method :	AS1289.1.2.1(6.5.3)	AS1289.1.2.1(6.5.3)	AS1289.1.2.1(6.5.4)	AS1289.1.2.1(6.5.4)
Material Source :	Site Derived	Site Derived	Site Derived	Site Derived
Material Type :	Insitu	Insitu	Insitu	Insitu
Sample Location :	Refer To Plan BCN - BH03  1.0 - 1.45 Metres	Refer To Plan NN - BH02  1.0 - 1.45 Metres	Refer To Plan VS - TP07  0.7 - 1.3 Metres	Refer To Plan VS - TP12  0.6 - 1.5 Metres
Lot Number :	-	-	-	-
Moisture Method :	AS1289.2.1.1	AS1289.2.1.1	AS1289.2.1.1	AS1289.2.1.1
Sample History :	Oven Dried	Oven Dried	Oven Dried	Oven Dried
Sample Preparation :	Dry	Dry	Dry	Dry
Notes :	No Cracking or Crumbling	No Cracking or Crumbling	Crumbling Occurred	No Cracking or Crumbling
Mould Length (mm) :			250.0	
Liquid Limit (%) :	51	38	52	50
Plastic Limit (%) :	13	12	17	12
Plasticity Index (%) :	38	26	35	38
Linear Shrinkage (%) :			10.0	

### SPECIFICATION DETAILS

Specification Number :			
Liquid Limit-Max :			
Plasticity Index-Max :			
Linear Shrinkage-Max :			
Remarks :	-		



Accredited for compliance with ISO/IEC 17025.

### APPROVED SIGNATORY

*Ryan Smith*  
 Ryan Smith - Senior Lab Technician  
 NATA Accreditation Number :  
 10784

## Emerson Class Report

Client :	Jacobs	Report Number:	3160187 - 6
Address :	Level 11, 462 Flinders Street, MELBOURNE, VIC, 3000	Report Date :	10/08/2016
Project Name :	Regulator Structures	Order Number :	
Project Number :	3160187	Test Method :	AS1289.3.8.1
Location :	Nyah, Burra Creek, Vinifera, Vinifera Sth & Burra B1 , Vic		Page 1 of 1

Sample Number :	163-2187	163-2191	163-2192	163-2193
Test Number :	2	6	7	8
Sampling Method :	AS1289.1.2.1(6.5.3)	AS1289.1.2.1(6.5.3)	AS1289.1.2.1(6.5.4)	AS1289.1.2.1(6.5.4)
Date Sampled :	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date Tested :	20/07/2016	20/07/2016	20/07/2016	20/07/2016
Material Type :	In situ	In situ	In situ	In situ
Material Source :	Site Derived	Site Derived	Site Derived	Site Derived
Lot Number :	-	-	-	-
Sample Location :	Refer To Plan BCN - BH03 1.0 - 1.45 Metres	Refer To Plan NN - BH02 1.0 - 1.45 Metres	Refer To Plan VS - TP07 0.7 - 1.3 Metres	Refer To Plan VS - TP12 0.6 - 1.5 Metres
Water Type :	Distilled Water	Distilled Water	Distilled Water	Distilled Water
Soil Description :	Clay Sandy	Clay Sandy	Clay Sandy	Clay Sandy
Water Temperature :	16	16	16	16
Emerson Class Number :	<b>Class 5</b>	<b>Class 5</b>	<b>Class 2</b>	<b>Class 5</b>
Remarks :				



Accredited for compliance with ISO/IEC 17025.

APPROVED SIGNATORY

*[Signature]*  
 Ryan Smith - Senior Lab Technician  
 NATA Accreditation Number  
 10784



## Emerson Class Report

Client :	<b>Jacobs</b>	Report Number :	<b>3160187 - 7</b>
Address :	<b>Level 11, 462 Flinders Street, MELBOURNE, VIC, 3000</b>	Report Date :	<b>10/08/2016</b>
Project Name :	<b>Regulator Structures</b>	Order Number :	
Project Number :	<b>3160187</b>	Test Method :	<b>AS1289.3.8.1</b>
Location :	<b>Nyah, Burra Creek, Vinifera, Vinifera Sth &amp; Burra B1 , Vic</b>	<b>Page 1 of 1</b>	

Sample Number :	163-2194	163-2195	163-2196	163-2197
Test Number :	9	10	11	12
Sampling Method :	AS1289.1.2.1(6.5.3)	AS1289.1.2.1(6.5.3)	AS1289.1.2.1(6.5.4)	AS1289.1.2.1(6.5.4)
Date Sampled :	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Date Tested :	20/07/2016	20/07/2016	20/07/2016	20/07/2016
Material Type :	In situ	In situ	In situ	In situ
Material Source :	Site Derived	Site Derived	Site Derived	Site Derived
Lot Number :	-	-	-	-
Sample Location :	Refer To Plan BCN - BH03 Tested with Raw Murray Water 1.0 - 1.45 Metres	Refer To Plan NN - BH02 Tested with Raw Murray Water 1.0 - 1.45 Metres	Refer To Plan VS - TP07 Tested with Raw Murray Water 0.7 - 1.3 Metres	Refer To Plan VS - TP12 Tested with Raw Murray Water 0.6 - 1.5 Metres
Water Type :	River Water	River Water	River Water	River Water
Soil Description :	Clay Sandy	Clay Sandy	Clay Sandy	Clay Sandy
Water Temperature :	16	16	16	16
Emerson Class Number :	<b>Class 5</b>	<b>Class 5</b>	<b>Class 2</b>	<b>Class 5</b>
Remarks :				



Accredited for compliance with ISO/IEC 17025.

**APPROVED SIGNATORY**

*[Signature]*  
 Ryan Smith - Senior Lab Technician  
 NATA Accreditation Number  
 10784





## Moisture Content Report

Client :	Jacobs	Report Number:	3160187 - 8a
Address :	Level 11, 462 Flinders Street, MELBOURNE, VIC, 3000	Report Date :	10/08/2016
Project Name :	Regulator Structures	Order Number :	
Project Number :	3160187	Test Method :	AS1289.2.1.1
Location:	Nyah, Burra Creek, Vinifera, Vinifera Sth & Burra B1, Vic	Page 1 of 1	

Sample Number :	163-2396		
Test Number :	13		
Sampling Method :	AS1289.1.2.1(6.5.4)		
Date Sampled :	22/06/2016		
Date Tested :	2/08/2016		
Material Type :	In situ		
Material Source :	Site Derived		
Sample Location :	Nyah- Murray River bank, 500m South East of Sill 3		
Oven Temperature (°C) :	105-110		
Soil Description :	Clay Sandy		
<b>Moisture Content (%) :</b>	<b>5.3</b>		
Sample Number :			
Test Number :			
Sampling Method :			
Date Sampled :			
Date Tested :			
Material Type :			
Material Source :			
Sample Location :			
Oven Temperature (°C) :			
Soil Description :			
<b>Moisture Content (%) :</b>			

Remarks : This Amended Report Replaces:3160187-8

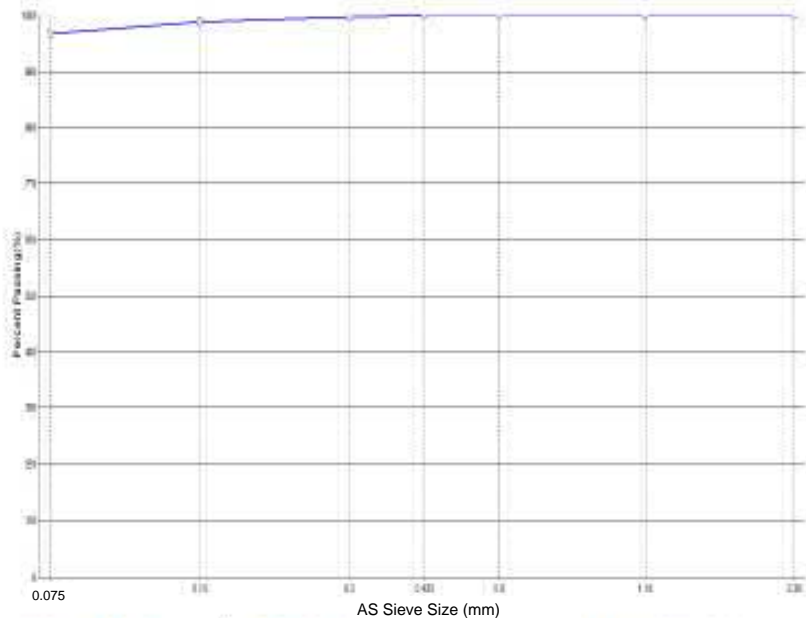
 <p><b>NATA</b> NATIONAL METROLOGY ACCREDITATION</p>	<p>Accredited for compliance with ISO/IEC 17025- Testing.</p>	<p>APPROVED SIGNATORY</p>  <p>Michael Bate - Branch Manager NATA Accreditation Number 10784</p>
---	---	--

## Quality of Materials Report

Client :	<b>Jacobs</b>	Report Number :	<b>3160187 - 9a</b>
Address :	<b>Level 11, 462 Flinders Street, MELBOURNE, VIC, 3000</b>	Report Date :	<b>9/08/2016</b>
Project Name :	<b>Regulator Structures</b>	Order Number :	
Project Number :	<b>3160187</b>	Test Method :	<b>AS1289.3.6.1</b>
Location :	<b>Nyah, Burra Creek, Vinifera, Vinifera Sth &amp; Burr</b>	<b>Page 1 of 1</b>	

Sample Number :	163-2396	SAMPLE LOCATION	
Sampling Method :	AS1289.1.2.1(6.5.4)	Nyah- Murray River bank, 500m South East of Sill 3	
Sampled By :	Ryan Smith		
Date Sampled :	22/06/2016	Test Number :	<b>13</b>
Date Tested :	8/08/2016	Lot Number :	-
Material Type :	Insitu	Specification Number :	
Material Source :	Site Derived		
Remarks :	This Amended Report Replaces:3160187-9		

AS Sieve Size(mm)	Percent Passing	Specification Limits
75.0		
63.0		
53.0		
37.5		
26.5		
19.0		
13.2		
9.5		
6.7		
4.75		
2.36	<b>100</b>	
1.18	<b>100</b>	
0.600	<b>100</b>	
0.425	<b>100</b>	
0.300	<b>100</b>	
0.150	<b>99</b>	
0.075	<b>97</b>	



Specification Limits	Plasticity Results	Test Results Determined in Accordance with the Following:	
Liquid Limit (%) :	<b>33</b>	Shrinkage Comments :	<b>Cracking &amp; Curling Occurred</b>
Plastic Limit (%) :	<b>14</b>	Mould Length (mm) :	<b>250</b>
Plasticity Index (%) :	<b>19</b>	Sample History	<b>Oven Dried</b>
Linear Shrinkage (%) :	<b>7</b>	Test Method:	<b>AS1289.3.1.2, 3.2.1, 3.3.1, 3.4.1</b>

Soil Description :



Accredited for compliance with ISO/IEC 17025-Testing.



**APPROVED SIGNATORY**

*(Signature)*  
 Michael Bate - Branch Manager  
 NATA Accreditation Number  
 10784

## Emerson Class Report

Client :	Jacobs	Report Number:	3160187 - 10a
Address :	Level 11, 462 Flinders Street, MELBOURNE, VIC, 3000	Report Date :	9/08/2016
Project Name :	Regulator Structures	Order Number :	
Project Number :	3160187	Test Method :	AS1289.3.8.1
Location:	Nyah, Burra Creek, Vinifera, Vinifera 5th & Burra B1 , Vic		Page 1 of 1

Sample Number :	163-2396	163-2461		
Test Number :	13	13		
Sampling Method :	AS1289.1.2.1(6.5.4)	AS1289.1.2.1(6.5.4)		
Date Sampled :	22/06/2016	22/06/2016		
Date Tested :	22/06/2016	2/08/2016		
Material Type :	Insitu	Insitu		
Material Source :	Site Derived	Site Derived		
Lot Number :	-	-		
Sample Location :	Nyah- Murray River bank, 500m South East of Sill 3	Nyah- Murray River bank, 500m South East of Sill 3 Tested with River Water		
Water Type :	Distilled Water	River Water		
Soil Description :	Clay Sandy	Clay Sandy		
Water Temperature :	16	16		
Emerson Class Number :	<b>Class 5</b>	<b>Class 5</b>		
Remarks :	This Amended Report Replaces:3160187-10			



 <p><b>NATA</b> NATIONAL ACCREDITATION AUTHORITY</p>	<p>Accredited for compliance with ISO/IEC 17025-Testing.</p>	<p><b>APPROVED SIGNATORY</b></p>  <p>Michael Bate - Branch Manager NATA Accreditation Number 10784</p>
---	--	---



## Emerson Class Report

Client :	Jacobs	Report Number:	3160187 - 12
Address :	Level 11, 462 Flinders Street, MELBOURNE, VIC, 3000	Report Date :	24/08/2016
Project Name :	Regulator Structures	Order Number :	
Project Number :	3160187	Test Method :	AS1289.3.8.1
Location:	Nyah, Burra Creek, Vinifera, Vinifera Sth & Burra B1, Vic	Page 1 of 1	

Sample Number :	163-2646	163-2647		
Test Number :	14	15		
Sampling Method :	AS1289.1.2.1(6.5.4)	AS1289.1.2.1(6.5.4)		
Date Sampled :	22/06/2016	22/06/2016		
Date Tested :	24/08/2016	24/08/2016		
Material Type :	In situ	In situ		
Material Source :	Site Derived	Site Derived		
Lot Number :	-	-		
Sample Location :	Refer To Plan VN-BH02 Tested with Raw Murray Water 1.5 - 1.95	Refer To Plan BCN-BH04 Tested with Raw Murray Water 1.0 - 1.45		
Water Type :	Murray River Water	Murray River Water		
Soil Description :	CLAY	CLAY sandy		
Water Temperature :	16	16		
Emerson Class Number :	<b>Class 5</b>	<b>Class 5</b>		
Remarks :				

 <p><b>NATA</b> NATIONAL ASSOCIATION OF ACCREDITATION</p>	<p>Accredited for compliance with ISO/IEC 17025- Testing.</p>	<p><b>APPROVED SIGNATORY</b></p>  <p>Michael Bate - Branch Manager NATA Accreditation Number 10784</p>
--	---	---

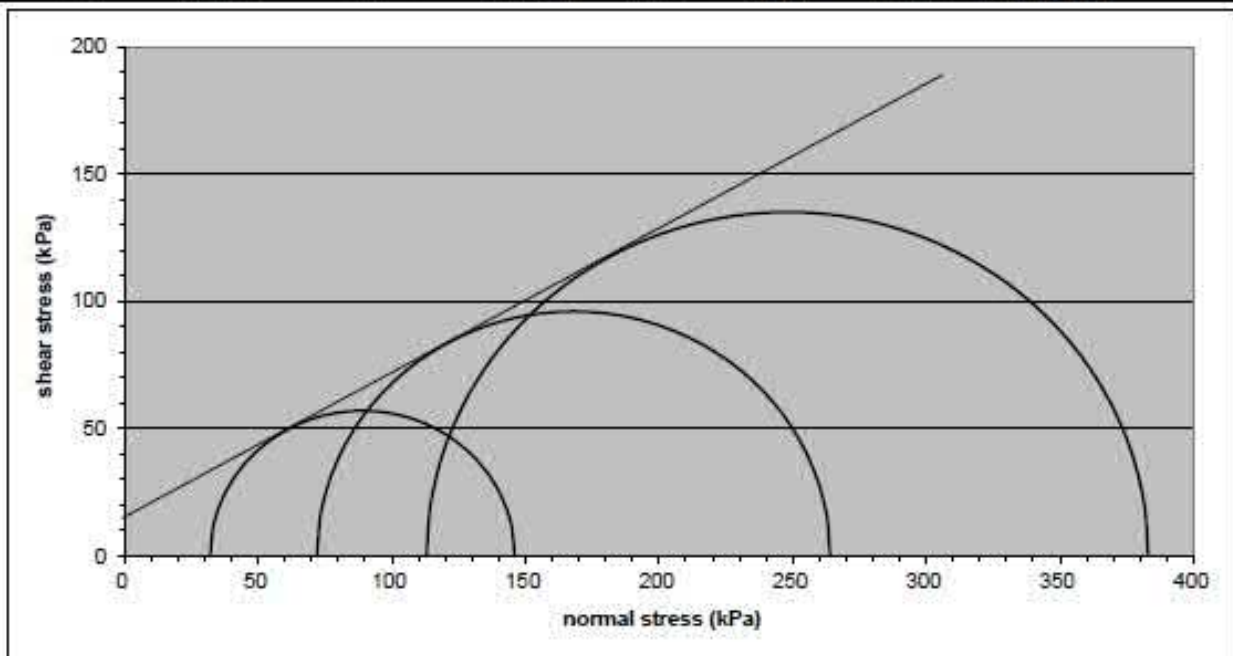




CU TRIAXIAL - Multistage with pore water measurement

client:	CIVILTEST PTY LTD (MORNINGTON)	job No.:	GS3457/1
principal:	-	date:	29/07/16
project:	BURRA B1 - REGULATOR STRUCTURE	report No.:	BP
location:	VICTORIA	page:	1 of 4

sample No.:	# 42	client sample No.:	163 - 1925	test type:	CUPP	test procedure:	AS 1289 6.4.2 1998
borehole:	BH3	sample type:	U63	back pressure:	50 kPa	normal stress:	50/100/150 kPa
depth:	1.50 - 1.95m	sample size:	63 X 127mm				



**results summary**

cohesion $c'$ :	15 kPa	initial dry density:	1.77 $t/m^3$
angle of friction $\phi'$ :	30 °	initial moisture content:	15.0 %
initial B response:	100 %	moisture content:	top middle bottom
		after test	% 21.0 22.2 23.0

sample description: silty CLAY, medium to high plasticity, mottled black grey brown

failure criteria: peak principal stress ratio failure mode: sheare failure

remarks: sampled by client, tested as received.  
 Mohr's circles are a graphical presentation of the results and are not to scale



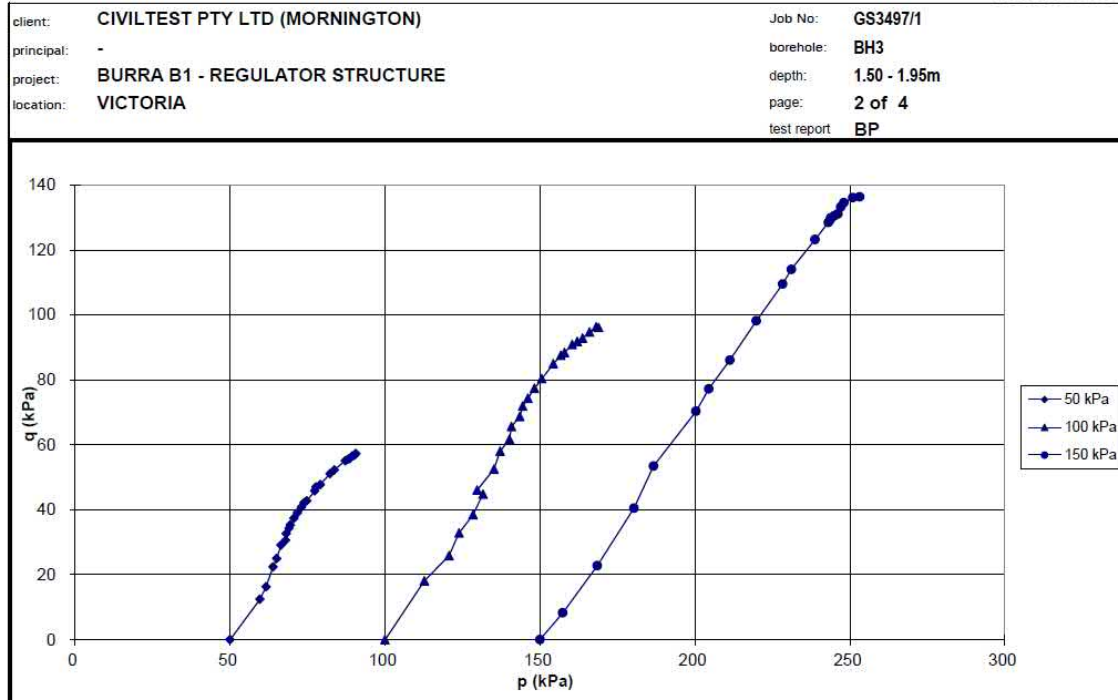
NATA Accredited Laboratory No. 15055  
 Accredited for compliance with ISO/IEC 17025  
 The results of the tests, calibrations and/or  
 measurements in this document are traceable to  
 Australian/National Standards

**Kamal Fernando**  
 Approved Signatory  
 Date 10-Aug-16



## p vs q Plot

GroundScience

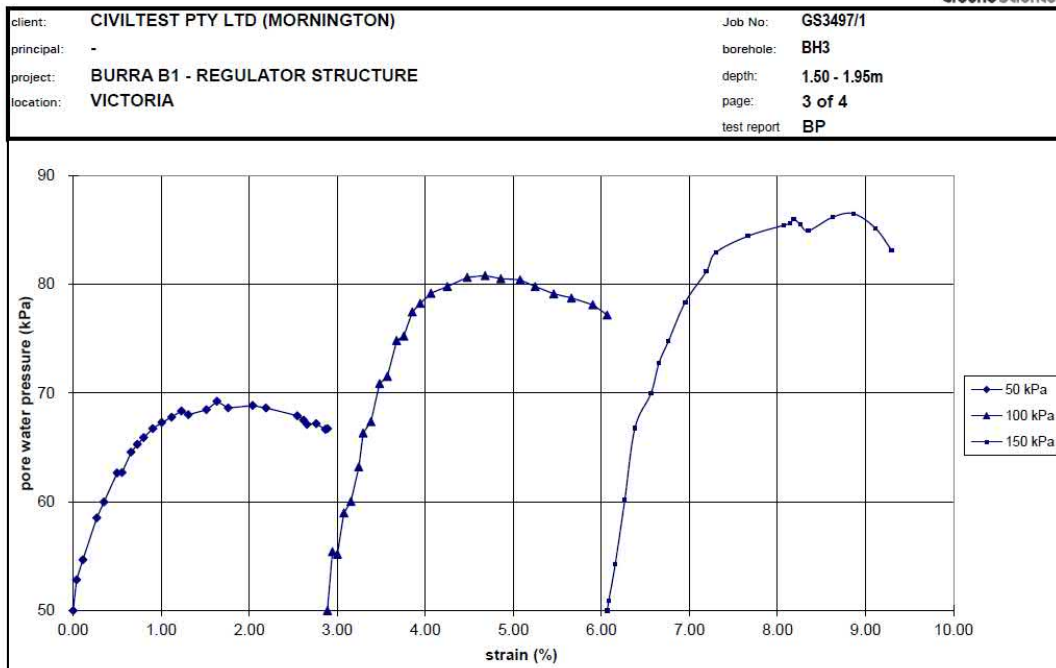


GS011/R Feb 11  
version 2 App EG



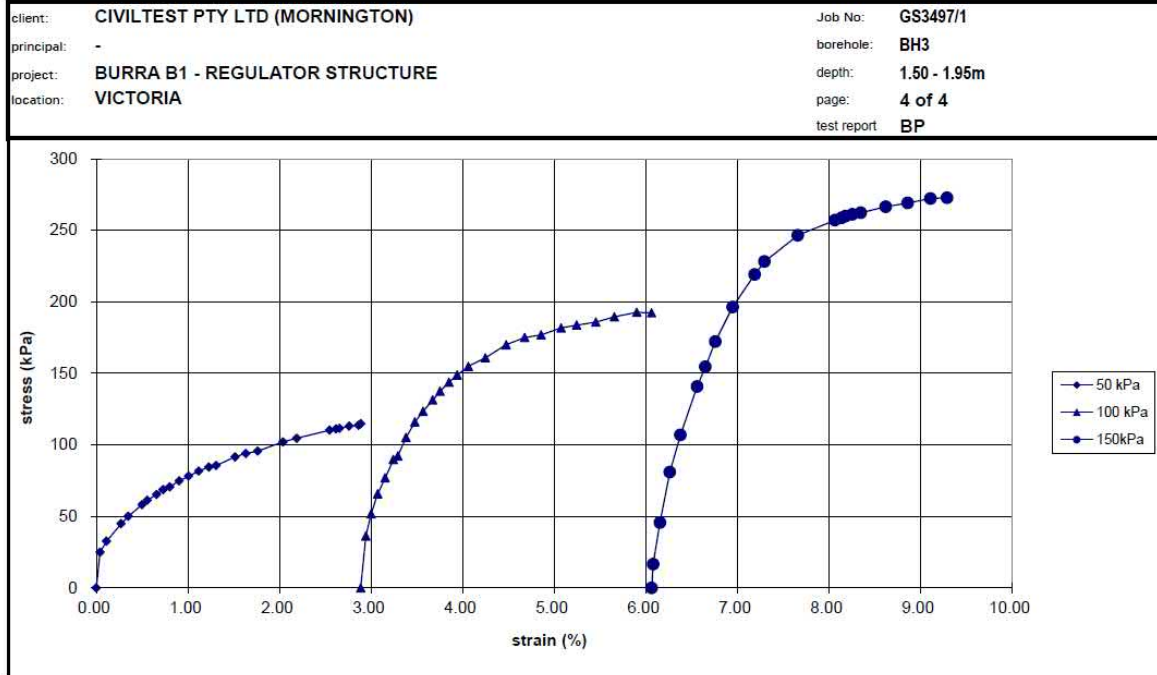
## Pore Water Pressure vs Strain %

GroundScience



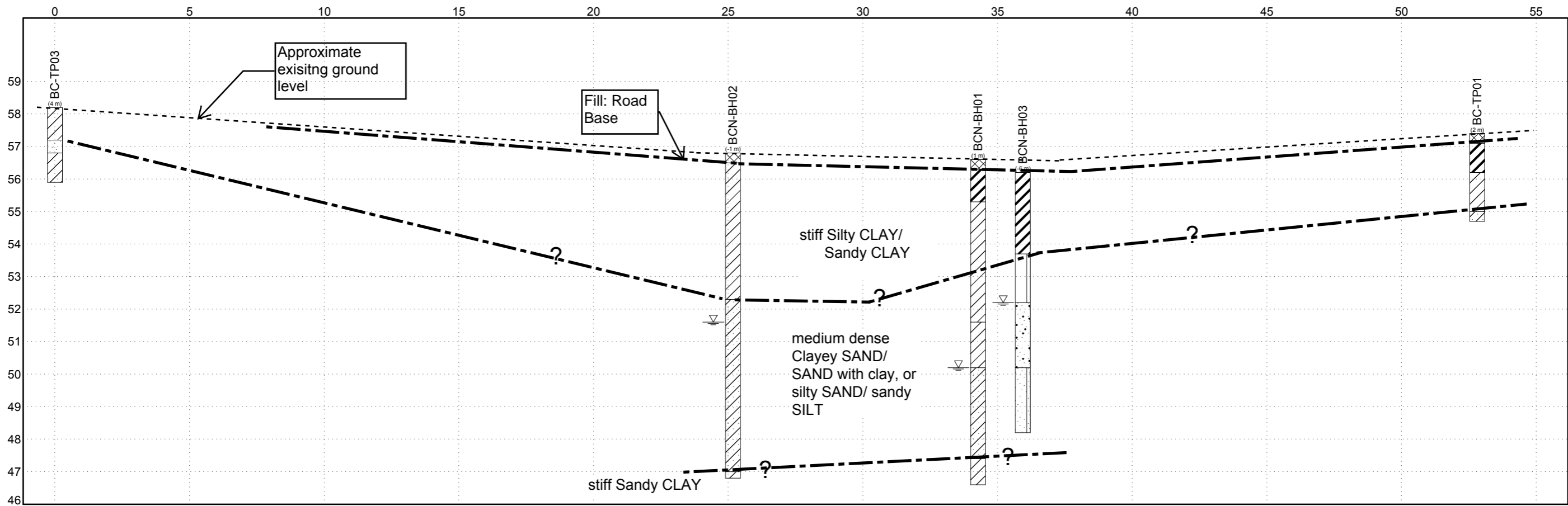
GS011/R Feb 11  
version 2 App EG

# Stress vs Strain %



## Appendix E. Ground Profile- Cross Sections





BC-TP03

BC-TP01

BCN-BH01

BCN-BH02

BCN-BH03

MAP KEY  
 ● Borehole  
 ■ Test pit/trial pit/trench/excavation



FILL	CL	SW
CH	SC	SM
CI	ML	SP

JACOBS AGS REV04 (WORKING).GLB Fence A3L NYAH BURRA VINIFERA GEOTECH JULY 2016.GPJ <<DrawingFile>> 23/08/2016 13:10

				<b>SCALES</b>		PREPARED BY		<b>JACOBS</b>			FILE No.	DRAWING	PRINTED DATE	SHEET No.
				H 1:157 V 1:130				<b>MALLEE CMA NYAH BURRA VINIFERA SUB SURFACE SECTION</b>			<<DrawingFile>>	23/08/2016		
											REGISTRATION NUMBER			
No.	Amendment Description	Initials	Date	DESIGNED:		REVIEWED:								
A3 Original	This sheet may be prepared using colour and may be incomplete if copied			Coordinate System: MGA94 Zone 54		Height Datum: AHD								