Borehole Log

Hole ID. BH5

WSP Environment & Energy
Level 1, 41 McLaren Street
North Sydney NSW 2060
Office: +61 (0)2 8925 6700
www.wspenvironmental.com

Project Name:	Columbia Precinct, Homebush	Date Started:	27/01/2011
Project Number:	15742	Date Completed:	27/01/2011
Location / Site:	Cnr Parramatta Rd & Columbia Ln, Homebush NSW	Hole Depth:	5.10 m
Client:		Ground Level:	----------
Drilling Company:	Auswide Geotechnical	Easting:	0323197
Drill Method:	Solid Flight Auger	Northing:	6251072
Logged By:	Aaron Young	Sheet:	1 of 1

Method	Water Level	Depth (m)	RL (m)	Graphic Log	USCS Symbol	Material Type	Material Description	DCP blows / 300mm	Pocket Penetrometer kPa	Moisture	Samples / Tests: PID ppm	Samples / Tests: ID No.	Observations / Comments
							Surface: Concrete						
DT		0				Fill	**CONCRETE** - 200mm.	6					
					CL		**FILL** - Silty Clay, grey.			Damp	0.0	BH5 / 0.3m	
							Silty CLAY - grey.	9	300	Damp			
							Silty CLAY - grey / yellow mottled, stiff, cohesive.	9		Damp	0.0	BH5 / 0.6m	
		1						13	450		0.0	BH5 / 1.0m	
					CL			25					
								28	350	Moist			
Solid Flight Auger	2.3m 27/01/2011	2				Natural	very stiff.	26	400		0.0	BH5 / 2.0m	
								70+					
								UTP	300				
		3			CL		**Silty CLAY** - grey / yellow, firm, cohesive, ironstone content.		180	Moist			
							Silty CLAY - light brown, firm.			Sat'd			
		4			CL						0.0	BH5 / 4.0m	
						Bedrock	**Extremely Weathered SHALE** - brown / grey, XW Rock.			Wet			
		5					**Refusal at 5.10 m** Auger refusal in Shale. DW Rock.						
		6											

Observations

Asbestos	No visual evidence of asbestos noted during drilling.
Staining	No visual evidence of contamination (e.g. staining) noted during drilling.
Odour	No olfactory (e.g. hydrocarbon odour) evidence of contamination noted during drilling.
Groundwater	Groundwater encountered during drilling.

Notes

1. Located between 2nd and 3rd support pillar in the central warehouse.

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Checked By:

Date:

WSP LOG LT 15742 HOMEBUSH.GPJ WSP LOG.GDT 10/2/11 12:50:33 PM

Borehole Log

Hole ID. BH6

WSP Environment & Energy
Level 1, 41 McLaren Street
North Sydney NSW 2060
Office: +61 (0)2 8925 6700
www.wspenvironmental.com

Project Name:	Columbia Precinct, Homebush	Date Started:	28/01/2011
Project Number:	15742	Date Completed:	28/01/2011
Location / Site:	Cnr Parramatta Rd & Columbia Ln, Homebush NSW	Hole Depth:	6.50 m
Client:		Ground Level:	----------
Drilling Company:	Auswide Geotechnical	Easting:	0323194
Drill Method:	Solid Flight Auger	Northing:	6251026
Logged By:	Aaron Young / JM	Sheet:	1 of 1

Method	Water Level	Depth (m)	RL (m)	Graphic Log	USCS Symbol	Material Type	Material Description	DCP blows / 300mm	Pocket Penetrometer kPa	Moisture	Samples / Tests ID No.	Observations / Comments
							Surface: Concrete					
DT						Fill	**CONCRETE** - 200mm.	10				
							FILL - Sandy Clay, black, red / brown, fine to coarse grained, uncontrolled.	25+		Dry	BH6 / 0.3m	No odour.
								UTP			BH6 / 0.7m	
		1					**FILL** - Sand, black, fine to coarse grained, angular, with clay content, uncontrolled.			Damp	BH6 / 1.0m	No odour.
								9				
					CL		**Silty CLAY** - grey, orange / red, very stiff, medium to high plasticty, MW~PL.	11	300	Moist	BH6 / 1.5m	No odour.
		2						18				
								26		Moist		No odour.
Solid Flight Auger					CL	Natural	**Silty CLAY** - yellow / orange, very stiff, medium to high plasticty.	41	450			
		3						38				
								END	500		BH6 / 3.0m	
									500			
		4							450			
					CL		**CLAY** - light brown, non plastic, with ironstone gravel content.			Moist		No odour.
		5										
		6										
					CL		**CLAY** - light brown, non plastic.			Moist		
						S'Rk	**Extremely Weathered SHALE** - brown / grey, XW Rock.			Moist		
		7					**Refusal at 6.50 m** Auger refusal in Shale. DW Rock.					

Observations		Notes
Asbestos	No visual evidence of asbestos noted during drilling.	
Staining	No visual evidence of contamination (e.g. staining) noted during drilling.	
Odour	No olfactory (e.g. hydrocarbon odour) evidence of contamination noted during drilling.	
Groundwater	No groundwater encountered during drilling.	

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Checked By: Date:

WSP LOG LT 15742 HOMEBUSH.GPJ WSP LOG.GDT 10/2/11 12:50:34 PM

Borehole Log

Hole ID. BH7

WSP Environment & Energy

Level 1, 41 McLaren Street
North Sydney NSW 2060
Office: +61 (0)2 8925 6700
www.wspenvironmental.com

Project Name:	Columbia Precinct, Homebush	Date Started:	28/01/2011
Project Number:	15742	Date Completed:	28/01/2011
Location / Site:	Cnr Parramatta Rd & Columbia Ln, Homebush NSW	Hole Depth:	6.70 m
Client:		Ground Level:	----------
Drilling Company:	Auswide Geotechnical	Easting:	0323223
Drill Method:	Solid Flight Auger	Northing:	6251013
Logged By:	JM	Sheet:	1 of 1

Method	Water Level	Depth (m)	RL (m)	Graphic Log	USCS Symbol	Material Type	Material Description	DCP blows / 300mm	Pocket Penetrometer kPa	Moisture	Samples / Tests: FID ppm	Samples / Tests: ID No.	Observations / Comments
							Surface: Concrete						
DT						Fill	**CONCRETE** - 650mm.						
Solid Flight Auger		1			CL		**FILL** - Sandy Clay, grey / orange / black, rock content.			Damp to Moist	102.3	BH7 / 0.7m	No Odour.
							Silty CLAY - grey, orange / light brown.	7	300	Damp		BH7 / 1.0m	No Odour.
		2			CL		**Silty CLAY** - grey / red, very stiff, cohesive, with ironstone gravels.	16	250	Damp	28.8	BH7 / 1.5m	No Odour.
								29					
								46	600+				
								60					
								END					
		3				Natural	**Silty CLAY** - grey, some orange, very stiff, cohesive, some red ironstone.		600+	Damp		BH7 / 3.0m	
		4			CL				600+				
		5							600+				
		6				Bedrock	**Extremely Weathered SHALE** - brown / grey, XW Rock.			Dry			
		7					**Refusal at 6.70 m** Auger refusal in Shale. DW Rock.						
		8											

Observations

Asbestos	No visual evidence of asbestos noted during drilling.
Staining	No visual evidence of contamination (e.g. staining) noted during drilling.
Odour	No olfactory (e.g. hydrocarbon odour) evidence of contamination noted during drilling.
Groundwater	No groundwater encountered during drilling.

Notes

1. 2 concrete slabs encountered. Ceramic pipe in second slab.

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Log Drawn By: Laurie White
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Checked By:

Date:

WSP LOG LT 15742 HOMEBUSH.GPJ WSP LOG.GDT 10/2/11 12:50:36 PM

Borehole Log

Hole ID. BH8

WSP Environment & Energy
Level 1, 41 McLaren Street
North Sydney NSW 2060
Office: +61 (0)2 8925 6700
www.wspenvironmental.com

Project Name:	Columbia Precinct, Homebush	Date Started:	28/01/2011
Project Number:	15742	Date Completed:	28/01/2011
Location / Site:	Cnr Parramatta Rd & Columbia Ln, Homebush NSW	Hole Depth:	3.10 m
Client:		Ground Level:	----------
Drilling Company:	Auswide Geotechnical	Easting:	0323308
Drill Method:	Solid Flight Auger	Northing:	6251088
Logged By:	JM	Sheet:	1 of 1

Method	Water Level	Depth (m)	RL (m)	Graphic Log	USCS Symbol	Material Type	Material Description	DCP blows / 300mm	Pocket Penetrometer kPa	Moisture	Samples / Tests: FID ppm	Samples / Tests: ID No.	Observations / Comments
							Surface: Concrete						
DT		0.5				Fill	**CONCRETE** - 200mm.						
							FILL - Clayey Sand, brown / red / black, soft, brick and rock content.	5		Moist	0.0	BH8 / 0.3m	
							FILL - Clay, light brown, medium stiff, non plastic.					BH8 / 0.5m	No odour.
					CL		**CLAY** - grey / light orange, stiff, cohesive, non plastic, with red ironstone content.	25			0.0	BH8 / 0.7m	No odour.
		1.0				Natural	**CLAY** - grey, light orange / red, very stiff, cohesive, with red ironstone content.	23	300	Damp		BH8 / 1.2m	
		1.5			CL			31					
								55	600+				
		2.0						70+				BH8 / 2.0m	
Solid Flight Auger		2.5				Bedrock	**Extremely Weathered SHALE** - grey / brown, dense, XW Rock.	UTP		Dry			
		3.0					**Refusal at 3.10 m** Auger refusal in Shale. DW Rock.						
		3.5											
		4.0											

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Observations

Asbestos	No visual evidence of asbestos noted during drilling.
Staining	No visual evidence of contamination (e.g. staining) noted during drilling.
Odour	No olfactory (e.g. hydrocarbon odour) evidence of contamination noted during drilling.
Groundwater	No groundwater encountered during drilling.

Notes

1. At 2.5m - bottom of push tube sampler fell off at bottom of borehole.

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Checked By: Date:

Borehole Log

Hole ID. BH9

WSP Environment & Energy

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Project Name:	**Columbia Precinct, Homebush**	Date Started:	**28/01/2011**
Project Number:	**15742**	Date Completed:	**28/01/2011**
Location / Site:	**Cnr Parramatta Rd & Columbia Ln, Homebush NSW**	Hole Depth:	**6.20 m**
Client:		Ground Level:	----------
Drilling Company:	**Auswide Geotechnical**	Easting:	**0323312**
Drill Method:	**Solid Flight Auger**	Northing:	**6251042**
Logged By:	**Aaron Young**	Sheet:	**1 of 1**

Method	Water Level	Depth (m)	RL (m)	Graphic Log	USCS Symbol	Material Type	Material Description	DCP blows / 300mm	Pocket Penetrometer kPa	Moisture	Samples / Tests ID No.	Observations / Comments
							Surface: Concrete					
DT						Fill	**CONCRETE** - 200mm.					
							FILL - Sandy Clay, red / orange / grey, non plastic.			Dry	BH9 / 0.3m	No odour.
							FILL - Sand, black, with clay and brick content.	3			BH9 / 0.5m	Hydrocarbon odour. Black staining.
					CL	Natural	**CLAY** - grey, firm, non plastic, with red ironstone content.	8		Damp		No odour.
		1			CL		**CLAY** - white / light orange, stiff, non plastic, with ironstone content.	24	300	Damp	BH9 / 1.0m	
								50				
					CL		**CLAY** - grey / light orange, very stiff, non plastic, with ironstone content.	70+		Damp		
		2						UTP	600+			
		3							600+			
		4				Bedrock	**Extremely Weathered SHALE** - brown, non cohesive, no plasticity, dense, some beading due to moisture content, XW Rock.			Dry to Moist		
		5					**Extremely Weathered SHALE** - brown, very dense, XW Rock.			Dry		
		6										
		7					**Refusal at 6.20 m** Auger refusal in Shale. DW Rock.					

Solid Flight Auger

Observations		Notes
Asbestos	No visual evidence of asbestos noted during drilling.	
Staining	Visual evidence of contamination (e.g. staining) noted during drilling.	
Odour	Olfactory (e.g. hydrocarbon odour) evidence of contamination noted during drilling.	
Groundwater	No groundwater encountered during drilling.	

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Checked By:

Date:

WSP LOG LT 15742 HOMEBUSH.GPJ WSP LOG.GDT 10/2/11 12:50:38 PM

Groundwater Well Log

Hole ID. BH10/GW3

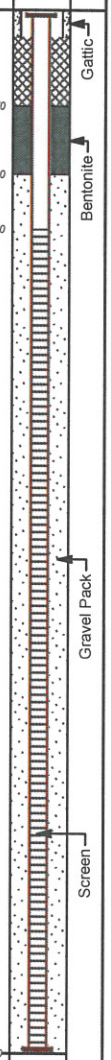
WSP Environment & Energy

Level 1, 41 McLaren Street
North Sydney NSW 2060
Office: +61 (0)2 8925 6700
www.wspenvironmental.com

Project Name:	Columbia Precinct, Homebush	Date Started:	28/01/2011
Project Number:	15742	Date Completed:	28/01/2011
Location / Site:	Cnr Parramatta Rd & Columbia Ln, Homebush NSW	Hole Depth:	7.60 m
Client:		Ground Level:	----------
Drilling Company:	Auswide Geotechnical	Easting:	0323287
Drill Method:	Solid Flight Auger	Northing:	6250976
Logged By:	JM	Sheet:	1 of 1

Method	Water Level	Depth (m)	RL (m)	Graphic Log	USCS Symbol	Material Type	Material Description	DCP blows / 300mm	Pocket Penetrometer kPa	Moisture	Samples / Tests: FID ppm	Samples / Tests: ID No.	Observations / Comments
							Surface: Concrete						
DT		0			Fill	Fill	**CONCRETE** - 200mm.	2					
							FILL - Silty Clay, red / orange, firm, non plastic, loose, possible ash content, black.	5		Damp	22.3	BH10 / 0.3m	
											24.7	BH10 / 0.6m	
		1			CL	Natural	**Silty CLAY** - dark brown / black, firm, non plastic.	8		Damp			
								7	180		22.5	BH10 / 1.0m	
								13					
		2			CL		**Silty CLAY** - dark brown, firm to stiff, non plastic, with red iron banding.	21	200	Moist			
								34	250			BH10 / 2.0m	
		3			CL		**Silty CLAY** - white, stiff to very stiff, non plastic, with ironstone banding.	55		Moist			
								END	350				
									600+			BH10 / 3.0m	
		4				Bedrock			600+				
							Extremely Weathered SHALE - orange / white / red, very dense, XW Rock.			Dry to Damp			
		5											
		6											
		7					**Extremely Weathered SHALE** - dark brown, very dense, some beading, XW Rock.			Dry to Damp			
		8					**Refusal at 7.60 m** Auger refusal in Shale. DW Rock.						

Solid Flight Auger



Observations

Asbestos	No visual evidence of asbestos noted during drilling.
Staining	No visual evidence of contamination (e.g. staining) noted during drilling.
Odour	No olfactory (e.g. hydrocarbon odour) evidence of contamination noted during drilling.
Groundwater	No groundwater encountered during drilling.

Notes

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Checked By:

Date:

WSP LOG LT 15742 HOMEBUSH.GPJ WSP LOG.GDT 10/2/11 12:50:26 PM

APPENDIX C Geotechnical Report

AUSWIDE geotechnical
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8th February, 2011

WSP Environmental Pty Ltd
Level 1/41 McLaren Street
NORTH SYDNEY NSW 2059

Our Reference **AW 24232**

Site Address

Columbia Precinct

Cnr Parramatta Road & Columbia Lane

Homebush

Commission

Geotechnical Investigation

Executive Summary

In our judgement, this site is suitable for the conceptual development from a Geotechnical point of view, subject to the constraints of our conclusions and recommendations.

There is a variation in fill depths across the site (300mm to 4500mm) and a variation in the depth to hard bedrock (3100mm to 7600mm) and the water table varies from between 1900mm to 3500mm at the four out of the ten locations we tested (i.e. the water table was not encountered within the limits of our testing at six of our test sites).

All of the above was not unexpected on a site like this and the challenges building the proposed development presents are not abnormal, and are dealt with on a daily basis by builders with similar structures on similar sites in and around Sydney.

1. Construction Proposal

1.1. The proposed development is the re-development of an older style industrial/commercial site.

1.2. The new development will be a mixed commercial/residential development with fifteen(15) different buildings (up to 21 storey's high) and basement carparking.

1.3. The proposal also includes parkland recreational areas.

1.4. The "Concept Master Plan" (preferred option) which we viewed is by P.D Mayoh Pty Ltd.

2. Site Description

2.1. The site is bounded by a rail line in the east; Parramatta Road in the North; and a storm water drain in the south and west.

2.2. In its current configuration the site is occupied by a series of low rise industrial/commercial/warehouse type buildings.

2.3. The site slopes gently towards the stormwater drain.

2.4. There is a mixture of bitumen and concrete pavements.

2.5. There are limited areas of grass, trees and open space and the majority of trees are along side the stormwater drain.

3. About Your Report

3.1. This geotechnical report is generally in accordance with the guidelines in AS 2870-1996 (Residential Slabs and Footings – Construction). We have also appended a copy of the following paper, which illustrates the relationship between landscaping/garden maintenance and structural footings.

CSIRO "Foundation Maintenance and Footing Performance: A Homeowner's Guide" Sheet BTF 18, 2003

3.2. The statements presented in this report, including attached appendices, are intended to advise you of what should be your realistic expectations of this report and to present you with recommendations as to how to minimise risks associated with ground works for this project.

3.3. These appendices and other cautioning sections are not intended to reduce our level of responsibility but rather to ensure that all parties who may rely on this report are aware of their responsibilities each assumes in so doing.

3.4. As geotechnical consultants on this project, our responsibilities are restricted to determining the parameters of the strata encountered (within the limitations of our commission and budget) so that the design engineer can design suitable footings.

3.5. As an additional service, we have offered advice in this report to the design engineer on the most suitable type of footing for this site, but it is possible that the engineer will have his own method of support for their structures.

3.6. AS 2870-1996 contains a system of classifying soils based on the ability of the soils to change in soil moisture. These classes are (Class "E" being most severe);

CLASS "A"	CLASS "S"	CLASS "M"	CLASS "H"	CLASS "E"

3.7. AS 2870-1996 also has another Class ("P") for problem sites which include both filled sites and sites with soft and collapsing soils. It should be noted that the more severe the soil conditions, the heavier and in general, the more expensive the footing system will be.

4. Testing Programme

4.1. Ten(10) test sites(TS) were bored with a 4WD mounted drill rig. These test sites were not surveyed, therefore their locations on the attached site sketch should be treated as approximate.

4.2. These boreholes had a duel purpose, as they were used for both environmental sampling and geotechnical testing and sampling.

NOTE: Only the Geotechnical testing and sampling is reported in this part of the report.

4.3. Three(3) of the test sites (TS No's 2, 4 and 10) were fitted out as ground water monitoring wells.

4.4. Numerous disturbed samples were collected and hand classified.

4.5. Selected undisturbed tube samples were collected and returned to the laboratory and tested for their shrink/swell (Iss) parameters (see section 5.8 below)

4.6. Selected tube samples were collected and returned to the laboratory and tested for their undrained, unconfined triaxial parameters (see section 5.9 below).

4.7. The resistance of the strata to a 9kg Dynamic Cone Penetrometer (DCP) was tested and recorded at the appropriate levels on the attached log sections as blows/300mm.

4.8. A pocket penetrometer (PP) was used to determine the undrained shear strength (qa) which was then converted to an undrained cohesion (ca) which in turn was used in Skempton's Theorem (1954) to determine the allowable bearing pressures. The undrained shear strength values are as recorded in the filed are on the attached log sections.

5. Findings

5.1. The strata encountered is recorded on the attached Log Section.

5.2. On the relevant 1:250,000 geological map, this site plots within the Wianamatta Group, which is a Triassic aged sedimentary rock unit.

5.2.1. In this area, the Wianamatta Group is represented by the Liverpool Sub-Group which has three(3) distinct members, and in this area the Ashfield shale is the underlying bedrock.

5.2.2. The stormwater drain is most likely the re-alignment of a previous creek so there maybe some recent aged alluvial sediments nearby, but along creeks they are generally too restricted in area to plot on a 1:250 000 map.

5.3. The water table was encountered at the following depths;

TS No.	Depth	TS No.	Depth
1	NE	6	NE
2	2600mm	7	NE
3	3500mm	8	NE
4	1900mm	9	NE
5	2300mm	10	NE

NE = Not Encountered

5.4. It is difficult to predict the long term fluctuations of a water table over a period of time as the water table is related to the climatic conditions that prevail at any specific period of time and the weeks to months prior however with on going monitoring via the monitoring wells placed as we approach construction time, more data should be available.

5.5. The ground surface at each test site was as follows;

TS No.	Surface Type	Thickness	TS No.	Surface Type	Thickness
1	Soil	NA	6	Concrete	200mm
2	Asphalt	50mm	7	Concrete	650mm
3	Asphalt	50mm	8	Concrete	200mm
4	Concrete	200mm	9	Concrete	200mm
5	Concrete	200mm	10	Concrete	200mm

NOTE: To access the soils at the locations with concrete paving, the concrete had to be cored.

5.6. The site was found to be filled to the following depths;

TS No.	Depth	TS No.	Depth
1	4500mm	6	1500mm
2	800mm	7	800mm
3	600mm	8	600mm
4	2800mm	9	600mm
5	300mm	10	700mm

5.7. Rock was encountered as follows;

TS No.	XW-Rock	Refusal on DW-Rock	TS No.	XW-Rock	Refusal on DW-Rock
1	6800-7400mm	7400mm	6	6300-6500mm	6500mm
2	4700-5600mm	5600mm	7	5900-6700mm	6700mm
3	4900-5600mm	5600mm	8	2200-3100mm	3100mm
4	5900-7500mm	7500mm	9	3500-6200mm	6200mm
5	4500-5100mm	5100mm	10	3900-7600mm	7600mm

For explanations on the rock classification see Appendix 9 of this report

5.8. The results of the shrink/swell tests are as follows;

TS No.	Depth (mm)	Shrink	Swell	Iss	Field Moisture
5	700-1100	1.2%	0.2%	0.7%	18.7%
8	700-1100	2.4%	0.04%	1.3%	15.5%
9	600-900	5.2%	1.3%	3.3%	24.3%

5.9. Four(4) tube samples were returned to the laboratory and an Undrained Shear Strength Triaxial via AS1289.6.4.1 was tested. The test result sheets have been appended to this report, but in summary the results are;

TS No.	Depth (mm)	Wet Density	Dry Density	Cohesion "C"	phi (∅)
7	2000-2400mm	2.19t/m^2	1.88t/m^2	71.6kPa	26.7°
7	5000-5500mm	2.11t/m^2	1.79t/m^2	61.1kPa	7.9°
10	2000-2400mm	2.15t/m^2	1.84t/m^2	39.4kPa	15.2°
10	5000-5300mm	2.15t/m^2	1.86t/m^2	311.4kPa	7.2°

6. Conclusions and Recommendations

6.1. With this development only at the "Concept Stage", we have provided an overview of parameters determined during our testing. As this project moves to the design stage, depending on how it is designed it may be necessary to carry out further onsite testing (not allowed for in this commission) to ensure that the most economical footing system suitable for the site can be designed.

6.2. Although this development is not under the scope of AS2870-1996, most consultants find it useful to relate the soil reactivity to AS2870, and on this basis using a Hs[1] = 1800mm, and a pF[2] of 1.2, we have derived a ys[3] in the range of 40-50mm.

6.3. The presence of filled ground deeper than 400mm generally makes the ys value only of academic value, as the performance of the fill due to its density etc is generally the dominating influence on high level footing performance.

6.4. The fill encountered appears to be variably compacted and in its current state under load we expect it to settle differentially and excessively.

6.5. Because of 6.3(above) any where the existing fill is to be used to support even a highly loaded walkway, we strongly recommend having it recompacted and certified at level 1 according to AS2798-2007.

NOTE 1: If clay based fill is compacted and certified the potential exists to dramatically increase the ys value therefore if new clay fill is to support any feature which will be sensitive to the shrink/swell movements of clay, a new assessment of the ys must be made, once the parameters of the clay fill are known.

NOTE 2: If the fill is not recompacted and certified, then any structural slab or footing will need to be fully suspended on piers taken down to suitable levels into the natural undisturbed soil profile (also refer to section 6.16 of this report).

1.1. _____

[1] *Hs = Depth of design soil suction change*
[2] *pF = Soil suction range*
[3] *ys = Characteristic Surface Movement*