idealgeotech
a division of idealcorp

Report on

Geotechnical Assessment

Prepared for: SGCH

Address: 36-38 Ironbark Avenue, Casula

Job No: 30895

Date: December 2017

Accredited for compliance
With ISO/IEC 17025
NATA Accreditation No. 19226

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1.0 INTRODUCTION

Ideal Geotech has prepared this report to discuss the results of the geotechnical investigation undertaken for the proposed residential development at 36-38 Ironbark Avenue, Casula.

The proposed development indicated by the client comprises the construction of a multi storey residential complex.

2.0 SITE DETAILS

The following information, presented in Table 1, describes the site.

Table 1: Summary of Site Details

Site Address	36-38 Ironbark Avenue, Casula
Client	SGCH
Council Area	Liverpool City Council

2.1 Geology

Reference to the Penrith 1:100,000 geological map (Geological series sheet 9130) indicates that the site is underlain by Bringelly Shale of the Wianamatta Group consisting of shale, carbonaceous claystone, laminite and lithic sandstone along with soils derived from the weathering of these rocks.

2.2 Site Description

The subject site is rectangular in shape and approximately 1,100m^2 in area. The site is bound by Ironbark Avenue to the north, Kurrajong Road to the south and neighbouring residential properties to the east and west.

The site is currently occupied by two existing houses with associated car ports and garages while 36 Ironbark Avenue contains a swimming pool in the backyard. Vegetation consists of grass cover and a few semi mature trees in the front and backyards. The site is located on gently sloping terrain with slopes sloping downwards towards the north east at gradients of approximately 1-2º.

3.0 GEOTECHNICAL INVESTIGATION

Fieldwork was undertaken on 8 December 2017 and included drilling three boreholes (BH1-BH3) using a 4WD mounted drill rig to a maximum depth of 4.6m at the locations shown on Figure 1, attached in Appendix A. The Boreholes were supplemented with Dynamic Cone Penetrometer (DCP) testing for the measurement of soil strength properties.

Borehole logs and field observations are presented in Appendix B.

3.1 Soil Profiles

A general summary of the subsurface conditions encountered across the site is presented in Table 2 below.

Table 2: Summary of Subsurface Conditions

Borehole	Depth of fill (m)	Depth to rock (m)	Termination depth (m)	Summary of sub-surface profiles
BH1	0.4	3.9	4.1	FILL-Sandy Gravelly SILT / Silty Gravelly CLAY / Silty CLAY / XW SHALE / DW SHALE
BH2	0.3	3.4	4.5	FILL-Sandy Gravelly SILT / Silty Gravelly CLAY / Silty CLAY / XW SHALE / DW SHALE
BH2	0.4	3.3	4.6	FILL-Sandy Gravelly SILT / Silty Gravelly CLAY / Silty CLAY / XW SHALE / DW SHALE

XW Extremely Weathered
DW Distinctly Weathered

Groundwater was not encountered in any of the boreholes at the time of investigation. It should be noted that groundwater levels are likely to fluctuate with variations in climatic and site conditions.

4.0 RECOMMENDATIONS

4.1 Site Classification

This site is classified as **Class H1** in accordance with AS2870 – 2011:

As defined in AS 2870-2011, Table 2.1 and section 2.2.3, this site will be classified as **Class H1, Highly Reactive** based on laboratory testing and natural soil profile as encountered on this limited scope investigation. The site is estimated to have a Characteristic Surface Movement (ys) in the range between **40mm** and **60mm**.

It must be emphasized that the soil movement (heave) mentioned and recommendations referred to in this report are based solely on the soil profile observed at the time of the investigation for this report, without taking into account any abnormal moisture conditions that might be created thereafter. With abnormal moisture conditions, distresses will occur and may result in non-acceptable probabilities of serviceability and safety of the building during its design life. If these distresses are not acceptable to the builder, owner or other relevant parties then further fieldwork and revised footing recommendations must be carried out.

This type of investigation (as per our commission) is not designed or capable of locating all soil conditions. Therefore, it is recommended that the builder engage the service of this company (Ideal Geotech) to confirm the soil profile and "Site Classification" at footing excavation stage if required.

4.2 Footings - Allowable Bearing Capacity

All footings should be founded below any uncontrolled fill or deleterious materials. All footings for the same structure should be founded on strata of similar stiffness and reactivity to minimise the risk of differential movements.

All footing excavations should be inspected prior to installation of structural steel by Ideal Geotech or a suitably experienced engineer or geotechnical consultant to confirm that the founding conditions are as described in this report. All loose material should be cleared from the footing excavations before concrete is poured.

4.2.1 High Level Footings

High-level footing alternatives could be expected to comprise slabs-on-ground with edge beams or pad footings for the support of concentrated loads. Such footings designed in accordance with engineering principles and founded in very stiff or better clays (below uncontrolled fill or other deleterious material) may be proportioned on an allowable bearing capacity of 150kPa. The founding conditions should be assessed by a geotechnical consultant or experienced engineer to confirm suitable conditions.

4.2.2 Piered Footings

Piered footings are considered as an alternative to deep edge beams or high level footings. Piered footings, founded in the extremely weathered shale could be proportioned on an end bearing pressure of 400kPa, and founded in the distinctly weathered shale could be proportioned on an end bearing pressure of 600kPa .

The potential for volume change in the subsurface profile should be considered by the designer as the piered footing may move with the soil and undergo differential settlement or heaving.

4.3 Batter Slopes

We understand that excavation will be required during the construction phase. Excavations or trenches in the very stiff or better clay could be expected to stand vertical in the short-term. Where personnel are to enter excavations, options for short-term excavations include benching or battering back of excavations to 1H:1V.

Unsupported permanent excavations (where not supporting existing structures) in the in situ material batters should be sloped back at gradients not steeper than 2H:1V subject to inspection of the strata exposed in the faces by a geotechnical professional.

Un-retained excavations should not extend below the “zone of influence” of adjacent structures. That is, a line drawn 45° down from the foundation level of adjacent structures or features (including paths, fences, stairs etc). If excavations are to extend below this line, proposed excavations are to be retained prior to excavation.

4.4 Excavation Conditions

Excavations should be readily achievable with conventional earthmoving equipment such as backhoes and excavators with bucket attachment to similar depths encountered in the boreholes.

We would recommend that the method and size of proposed excavation equipment are advised and inspected prior to excavation.

5.0 LIMITATIONS

This type of investigation (as per our commission) is not designed or capable of locating all ground conditions, which can vary even over short distances. The advice given in this report is based on the assumption that the test results are representative of the overall ground conditions. However, it should

be noted that actual conditions in some parts of the site might differ from those found. If excavations reveal ground conditions significantly different from those shown in our findings, Ideal Geotech must be consulted.

The scope and the period of Ideal Geotech services are described in the report and are subject to restrictions and limitations. Ideal Geotech did not perform a complete assessment of all possible conditions or circumstances that may exist at the Site. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Ideal Geotech in regards to it.

Where data has been supplied by the client or a third party, it is assumed that the information is correct unless otherwise stated. No responsibility is accepted by Ideal Geotech for incomplete or inaccurate data supplied by others.

Any drawings or figures presented in this report should be considered only as pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions should not be used for accurate calculations or dimensioning.

6.0 REFERENCES

- *Geological Series Sheet 9030, Map of the Penrith region, scale 1:100,000*

For and on behalf of
Ideal Geotech

Murali Pamu
Geotechnical Engineer

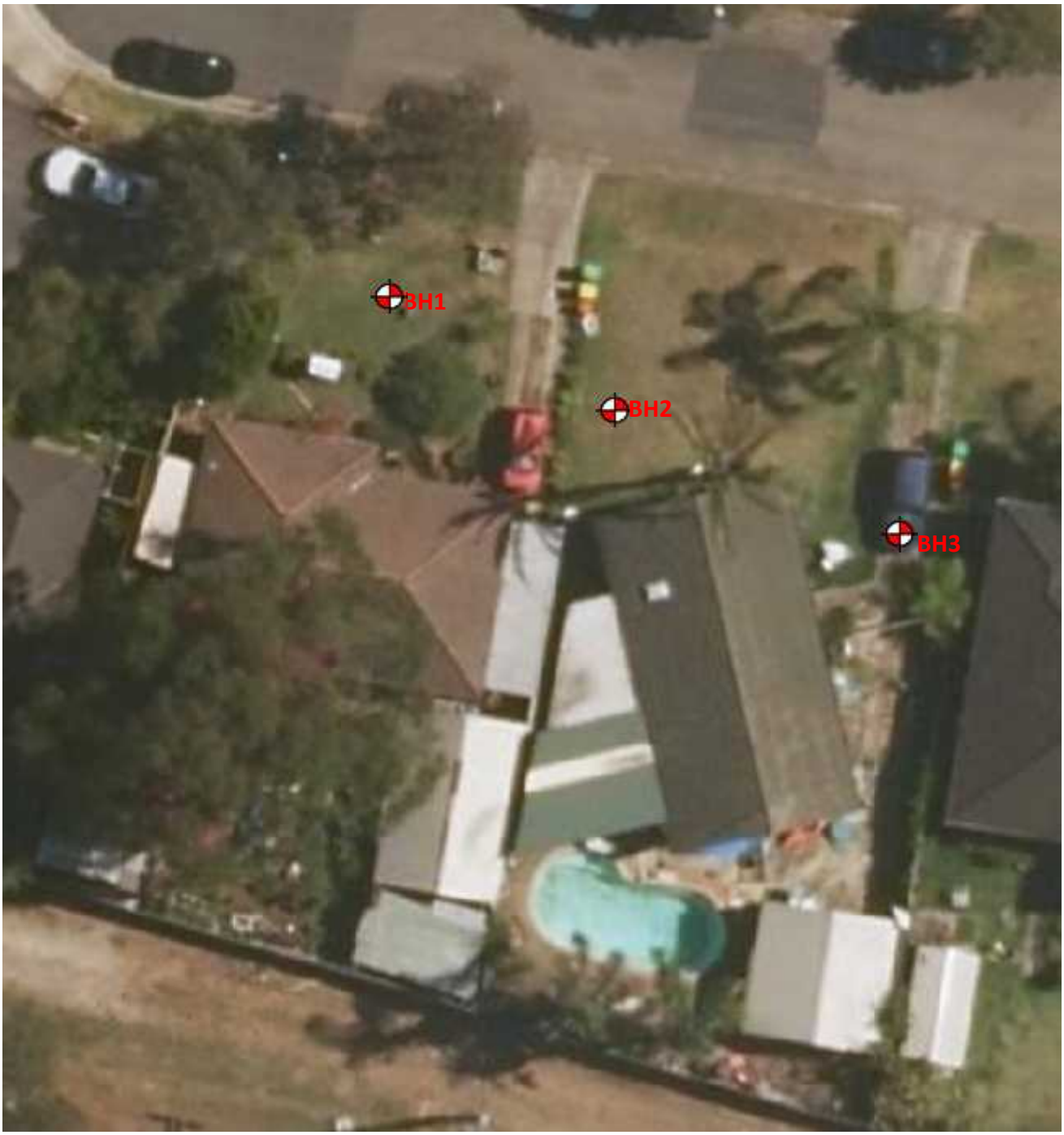
Dane Dwyer
Geotechnical Engineer

APPENDIX A

FIGURES

Figure 1 – Borehole Location Plan

36-38 Ironbark Avenue, Casula



APPENDIX B

BOREHOLE LOGS

idealgeotech a division of idealcorp

Customer Job: 0 | Ideal Job: 30895-IDF | Date: 08-December-2017

5.0 FIELD RECORD OF TEST BORING AND/OR IN SITU TESTING

Fill | Natural Soil | FOUNDING

Bore Hole 1

Depth (m)	DCP 1	P.P	Soil Profile
0.0	4		FILL SANDY GRAVELLY SILT, MI
	8		brown, moist
	12		
	8		SILTY GRAVELLY CLAY, CI
0.5	8		pale brown, moist, very stiff
	7		
	9		
	9		
	12		grey mottled brown, hard
1.0	12		
	13		
	13		
	12		
	10		
1.5	10		
	10		SILTY CLAY, CH
	11		grey mottled orange, moist, hard
	12		
	12		
2.0	12		
	10		
	10		
	10		
	15		
2.5	17		
	28		
	40+		
3.0			
			XW SHALE
			grey-brown
3.5			
			DW SHALE
			grey-brown
4.0			
			End borehole 4.1m due to
			practical refusal
4.5			
5.0			
5.5			
6.0			

Bore Hole 2

Depth (m)	DCP 2	P.P	Soil Profile
0.0	4		FILL SANDY GRAVELLY SILT, MI
	15		brown, moist
	26		
	7		SILTY GRAVELLY CLAY, CI
0.5	8		pale brown, moist, very stiff
	8		
	8		
	10		
	17		
1.0	22		
	18		
	5		grey mottled brown, stiff
	5		
	5		
1.5	4		
	4		
	4		
	4		
	4		SILTY CLAY, CH
2.0	6		grey mottled orange, moist, hard
	10		
	10		
	9		
	12		
2.5	9		
	40+		
3.0			
			XW SHALE
			grey-brown
3.5			
4.0			
			DW SHALE
			grey-brown
4.5			
			End borehole 4.5m due to
			practical refusal
5.0			
5.5			
6.0			

Depth (m)	DCP 3	P.P	Soil Profile
0.0	4		FILL SANDY GRAVELLY SILT, MI
	5		brown, moist
	8		
	8		
0.5	8		SILTY GRAVELLY CLAY, CI
	7		pale brown, moist, very stiff to hard
	8		
	9		
	9		
1.0	12		
	11		grey mottled brown
	12		
	7		
	7		
1.5	7		
	8		SILTY CLAY, CH
	8		grey mottled orange, moist, hard
	8		
	10		
2.0	12		
	13		
	16		
	14		
	14		
2.5	24		
	28		
	40+		
3.0			
			XW SHALE
			grey-brown
3.5			
4.0			
			DW SHALE
			grey-brown
4.5			
			End borehole 4.6m due to
			practical refusal
5.0			
5.5			
6.0			

Notes: DCP = Dynamic Cone Penetrometer blow counts (blows/100mm). P.P = Pocket Penetrometer (Undrained Shear Strength Cu) PSP = Perth Sand Penetrometer (blows/100mm) UTP = Unable to penetrate.

TABLE 5.1 **For SAND correlation between Density Index & Penetrometer results**

DENSITY Term	Density Index (%)	Approx DCP Blow Count (blows/100mm)
Very Loose	< 15	< 1
Loose	15 to ≤35	1 to ≤3
Medium Dense	35 to ≤65	3 to ≤9
Dense	65 to ≤85	9 to ≤15
Very Dense	> 85	> 15

TABLE 5.2 **For SILTS & CLAY correlation between Cu & Penetrometer results**

CONSISTENCY Term	Undrained Shear Strength (kPa)	Approx DCP Blow Count (blows/100mm)	PP Idial indicator)
Very Soft	0 - 12	< 1	0 to ≤ 0.2
Soft	12 to ≤25	1 to ≤ 2	0.2 to ≤0.5
Firm	25 to ≤50	2 to ≤3	0.5 to ≤1
Stiff	50 to ≤100	3 to ≤5	1 to ≤2
Very Stiff	100 to ≤200	5 to ≤8	2 to ≤4
Hard	> 200	> 8	>4

APPENDIX C

LABORATORY TEST RESULTS

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Liquid Limit and Linear Shrinkage Test Results

Customer:	**George Bakopoulos - SGCH**	Ideal Job No:	**30895-IDF**	Report No	**30895 L1**
Address:	**36-38 Ironbark Avenue CASULA**			Test Date:	**12/12/17**

Test No:	L1	Depth (m):	1.0m	Borehole No:	1

Sample No	Depth (m)	Material Description (visual)	Codes	Liquid Limit %	Linear Shrinkage %
L1	1.0m	Red brown silty CLAY	1,6,**	57%	12.0%

CODES/LEGEND

NO - Not Obtainable

Sample History

1 - Air Dried 2 - Low Temperatures (<50C) Oven Dried 3 - Oven (105C) Dried 4 - Unknown 5 - Natural

Method of Preparation

6 - Dry Sieved 7 - Wet Sieved

Shrinkage sample

(CR) - Crumbled (CU) - Curled

** Mould Length is 125mm *** Mould Length is 150mm

Test Methods

Linear Shrinkage AS1289.3.4.1 & Liquid Limit AS1289.3.1.2

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Accreditation No 19226

Checked By Murali.P
Dated 18-Dec-17

Approved Signatory Murali.P

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Liquid Limit and Linear Shrinkage Test Results

Customer:	**George Bakopoulos - SGCH**	Ideal Job No:	**30895-IDF**	Report No	**30895 L2**
Address:	**36-38 Ironbark Avenue CASULA**			Test Date:	**12/12/17**

Test No:	L1	Depth (m):	1.5m	Borehole No:	2

Sample No	Depth (m)	Material Description (visual)	Codes	Liquid Limit %	Linear Shrinkage %
L1	1.5m	Grey mottled red silty CLAY	1,6,**	60%	11.0%

CODES/LEGEND

NO - Not Obtainable

Sample History

1 - Air Dried 2 - Low Temperatures (<50C) Oven Dried 3 - Oven (105C) Dried 4 - Unknown 5 - Natural

Method of Preparation

6 - Dry Sieved 7 - Wet Sieved

Shrinkage sample

(CR) - Crumbled (CU) - Curled

** Mould Length is 125mm *** Mould Length is 150mm

Test Methods

Linear Shrinkage AS1289.3.4.1 & Liquid Limit AS1289.3.1.2

Accredited for compliance
with ISO/IEC 17025
Accreditation No 19226

Checked By Murali.P
Dated 18-Dec-17

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