

**** APPENDIX**

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RRD002G1T1

Document Number: RDC-992918

Date Registered: 25/2/2020

NZS 4218:2009 CALCULATION METHOD TOOL

PROJECT SUMMARY

Project name	New Gourlay Home
Address	16 Oaklands Place, Ngongotaha Rotorua
Designer	
Address	PO Box 908, Rotorua
Phone	07 929 9807
Date	
Reference number	GH84

Climate zone	2: Rest of North Island not in zones 1 or 3									
Wall construction type	1: Any wall type									
If mixed wall types	<table border="1"> <tr> <td></td> <td>0</td> <td>Percentage of wall area solid timber construction</td> </tr> <tr> <td></td> <td>0</td> <td>Percentage of wall area high thermal mass construction</td> </tr> <tr> <td></td> <td>100</td> <td>Percentage of wall area "Any wall type"</td> </tr> </table>		0	Percentage of wall area solid timber construction		0	Percentage of wall area high thermal mass construction		100	Percentage of wall area "Any wall type"
	0	Percentage of wall area solid timber construction								
	0	Percentage of wall area high thermal mass construction								
	100	Percentage of wall area "Any wall type"								
If solid timber wall	1: External 75 mm thick solid timber and timber framed internal walls									

Summary of calculation method heat loss

Element	Area (m ²)	Proposed building heat loss (W/°C)	Reference building heat loss (W/°C)
Roofs/ceilings	174.8	56.8	60.3
Walls	162.2	51.1	85.4
Floors			
Vertical glazing	35.3	135.9	228.0
Skylights	0.0	0.0	-
Doors	0.0	0.0	-
Total		371.1	508.1 W/°C

Glazing percentage: 18%

Glazing <40%: Yes

Minimum R-values OK: Yes

Issues to check:

PASS/FAIL

PASS

NZS 4218:2009 CALCULATION METHOD TOOL

I New Altered Alpha

Roofs/ceilings: Skylights are not included here. Enter them in the skylights table below.

Roof/ceiling	Description	Area (m ²)	Construction R-value	Heat loss
1	Roofing Metal Tile(R3.2)	174.78	3.077	56.8
2				
3				
4				

Total area 174.78 m²

1: Any wall type

Total roofs/ceilings heat loss 56.8 W/°C

Skylights: Skylights are at an angle of 60° or less to the horizontal. If the skylight R-value is not known, use a value of 0.15.

Skylight	Description	Area (m ²)	Construction R-value	Heat loss
1				
2				
	From Skylight Schedule	0		0.0

Total area 0 m²

Total skylight heat loss 0.0 W/°C

Walls: Doors are not included here. Enter them in the door table.

Wall element	Description	Perimete Stud He Area (m ²)	Construction R-value	Heat loss
Cladding type 1	Timber Weatherboard (R2.2)	56.43 2.42 136.5606	2.16	63.2
Cladding type 2	Garage wall (R2.2)	10.61 2.42 25.6762	1.98	13.0
Cladding type 3				
Cladding type 4				
Cladding type 5				
Cladding type 6				

Total area 162.2368 m²

Total wall heat loss 76.2 W/°C

Floors: Only include the ground or exterior floors. Intermediate floors not exposed to the exterior are excluded.

Floor element	Description	Area (m ²)	Construction R-value	Heat loss
1	Timber Subfloor	174.78	1.71	102.2
2				
3				
4				

Total area 174.78 m²

Floor heat loss 102.2 W/°C

Vertical glazing: Vertical glazing only (steeper than 60°), including glazing in doors. Skylights are on the Skylight table.

If the glazing R-value is not known, use a value of 0.15

Glazing element	Description	Area (m ²)	Construction R-value	Heat loss
1	Refer to element schedules			
2				
	From Glazing Schedule	35.338		135.9

Total area 35.338 m²

Total vertical glazing heat loss 135.9 W/°C

Doors: Only the non-glazed area of doors is included. The glazed area of doors must be entered in the Glazing table.

The heat loss of doors is automatically set to 0 if the total door area is ≤ 6m² or 6% of the total wall area.

If the R-value of a door is not entered a default value of R 0.18 is automatically used.

Door element	Description	Area (m ²)	Construction R-value	Heat loss
1				0.0
2				0.0
	From Door Schedule	0		0.0

Total area 0

Total door heat loss 0.0 W/°C

NZS 4218:2009 CALCULATION METHOD TOOL

1 New Altered Alpha

125 Oaklands Place, Ngongotaha Rotorua

If the glazing R-value is not known, use a value of 0.15. Skylights are on the Skylight table.

ID	Description	cladding	Height (mm)	Width (mm)	Construction	R-value	Area (m²)	Heat loss
1		w01	1	2050	1360	0.26	2.788	10.7
2		w02	1	1000	2000	0.26	2	7.7
3		w03	1	1000	600	0.26	0.6	2.3
4		w04	1	1000	600	0.26	0.6	2.3
5		w05	1	1200	2000	0.26	2.4	9.2
6		w06	1	2000	3200	0.26	6.4	24.6
7		w07	1	1500	2700	0.26	4.05	15.6
8		w08	1	1000	700	0.26	0.7	2.7
9		w09	1	2000	2400	0.26	4.8	18.5
10		w10	1	1000	700	0.26	0.7	2.7
11		w11	1	1000	700	0.26	0.7	2.7
12		w12	1	1200	2000	0.26	2.4	9.2
13		w13	1	1200	2000	0.26	2.4	9.2
14		w14	1	1200	2000	0.26	2.4	9.2
15		w15	1	1000	800	0.26	0.8	3.1
16		w16	1	1000	1600	0.26	1.6	6.2
17	(Garage) w17							
18	(Garage) w18							
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32	Cladding type one total						35.338	
33	Cladding type two total						0	
34	Cladding type three total						0	
35	Cladding type four total						0	
36	Cladding type five total						0	
37	Cladding type six total						0	

Total area 35.3 m²

Total vertical glazing heat loss 135.9

Door Schedule

Doors: Only the non-glazed area of doors is included. The glazed area of doors must be entered in the Glazing.

The heat loss of doors is automatically set to 0 if the total door area is ≤ 6m² or 6% of the total wall area.

If the R-value of a door is not entered a default value of R 0.18 is automatically used.

ID	Description	Quantit	Width (mm)	Height (mm)	Construction	R-value	Area (m²)	Heat loss
1								
2								
3								
4								
5								
6								

Total area 0.0 m²

Total door heat loss 0.0

Skylight Schedule

Skylights: Skylights are at an angle ≤ 60° to the horizontal.

ID	Description	Quantit	Width (mm)	Height (mm)	Construction	R-value	Area (m²)	Heat loss
1	Lounge							
2	Ensuite							
3								
4								
5								
6								

Total area 0.0 m²

Total skylight heat loss 0.0

Roof: Timber framed roof, direct fixed or battened flat ceiling

external surface 0.03	
Roofing Metal tiles with building paper	
R-value 0.01	
Insulation f	
Timber Frame & Cavity	
90mm rafters or joists @ 900mm, battens (covered with insulation)	
Frame Area: 5%	Cavity Area: 95%
Roof space (still air) 0.11	Roof space (still air) 0.11
Trusses and dwangs	Insulation 3.2
R-value 0.75	
Ceiling Lining Gypsum plasterboard 13mm	
R-value 0.06	
internal surface 0.09	
Recessed downlights	
Ceiling area (m²):	Number of downlights: Clearance from lamp holder side (m):

Resulting R-value: **3.09** m²K/W

1. Any wall type

R Value Downlight Adjustment

R value Insulated roof	3.09
Overall area of ceiling	174.78 m²
Number of Downlights	26 downlights
Downlight Clearance	0.1 m
Un-insulated ceiling area	0.816814 m²
Insulated ceiling area	173.9632 m²

Overall R-Value or Roof **R 3.077**

Calculation:

Area of un-insulated ceiling = $3.14159(\pi) \times r^2 \times \text{number of downlights}$

Area of insulated ceiling = overall area - uninsulated area

(Assuming an R-value of R0.25 for un-insulated ceilings)

Average R-value = $\frac{[R0.25 \times \text{area of un-insulated ceiling}] + [R3.09 \times \text{area of insulated ceiling}]}{\text{divided by overall ceiling area}}$

Wall: Timber frame (direct fixed cladding)

external surface 0.03	
Cladding: Gypsum plasterboard 10mm into still air (garage, etc.)	
R-value: 0.1	
Air Barrier: none	
R-value: 0	
Timber Frame & Cavity: 90mm, studs @ 600mm, dwangs @ 800mm	
Frame Area: 14.4%	Cavity Area: 85.6%
Timber Frame	Insulation: 2.2
R-value: 0.75	
still Airgap: none	
R-value: 0	
Wall Lining: Gypsum plasterboard 10mm	
R-value: 0.04	
internal surface 0.09	

Resulting R-value: 1.98 m²K/W

Timber Weatherboard on studs @ 600cns

2.16 m²K/W

Type: Wall: Timber frame with vented cavity

timber frame with vented cavity

external surface 0.03	
Cladding: Bevelled weatherboard with building paper	
R-value: 0.28	
Air Barrier: Building paper	
R-value: 0.01	
Timber Frame & Cavity: 90mm, studs @ 600mm, dwangs @ 800mm	
Wall Frame Area: 14.4%	Cavity Area: 85.6%
15-90mm vented cavity (all R-values on ext. side of cavity will be halved), R: 0.08	15-90mm vented cavity (all R-values on ext. side of cavity will be halved), R: 0.08
Framing	Insulation: 2.2
R-value: 0.75	
still Airgap: none	
R-value: 0.00	
Wall Lining: Gypsum plasterboard 10mm	
R-value: 0.04	
internal surface 0.09	

Timber Subfloor

1.79 m²/CAW

Type: Floor: Suspended Floor (no Lining)

Suspended Floor (no Lining) [view detail](#)

Internal surface 0.09

Flooring: 20mm Particle Board

R-value: 0.17

Timber Frame & Cavity 140mm joists @ 400mm

Floor Frame Area:
11.3%

Cavity Area: 68.7%

Framing
R-value: 1.16

Snugfloor R1.6 1.6

Insulation value of the subfloor space

Suspended floor area (m²): 174.7:

Perimeter length (m): 67.04

Perimeter height (m): 0.9

Perimeter type: Exposed floor (pole house)

For valley/chimney truss tying unless stated otherwise use a pair of wire dips at 900mm centres for up to and including a very high wind zone. Or a pair of C-T200's at 900mm centres for extra high wind zone. This form is to meet the minimum requirements as per BS5596:04

**Your
Building Partner**

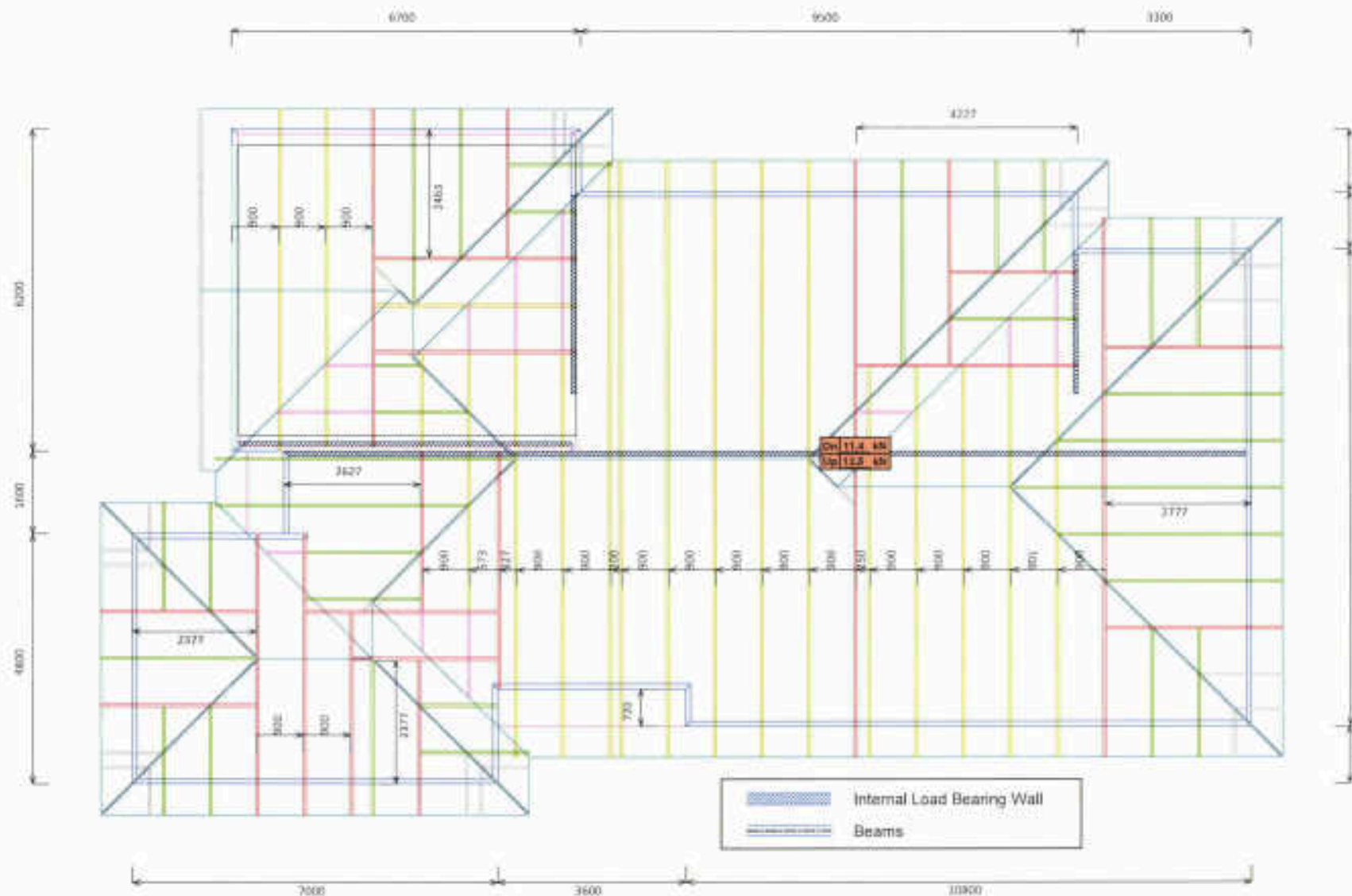
Flange shoes are for tying shoes to the top plate. Any other good fastenings should be used for the flange shoe to the top plate, and to bottom plate. Bottom plate to shoe require the reversibility of the architect / manufacturer.

EASE NOTE: The trusses on this job have been designed based on direct fixed ceiling battens restraining truss bottom chords, not metal ceiling battens on clips.
All gable trusses are designed to meet cladding manufacturer's framing requirements.
If a gable truss requires a windbeam brace, the type of MiTek brace will be noted as such on the layout.

BUILDABLE CONSENT LAYOUT

CARTERS

**Your
Building Partner**



CARTERS
Carters Manufacturing Cambridge
(07) 3431049

JOB No 267122C2

Client: GOURLAY HOMES LIMITED
Job: MARK LAM
Site: 16 OAKLAND PLACE
NGONGHATAHA
ROTORUA

Pitch: 25.0deg
Roof Type: Metal Tiles
Overhang: 600mm
Wind Area: High
Roof Snow: 0.00kPa

Trusses and rafters at 900 mm
max centres unless stated otherwise.
This layout is to be read in conjunction
with the Architectural plans.

DRAWN: David Shaw 18 Sep 2019



Ultimate Limit
State Loads

Notification of point loaded lintels
or point loads on internal walls
where the downward load is
higher than 8kN (85mm raft type slab)
or 10kN (100mm standard slab), or
the upward load is greater than 10kN.

Any roof loads as stated on this
layout over 15kN up or down are
outside the scope of NZS3604, and
the architect / draughtsperson is
responsible for the design to transfer
the loads to the ground.

The lintels have been sized using
one of the following:

HyDO, HyONE and HySPAN lintels
have been sized using the design?
for houses - New Zealand series 6
software.

GANGLAM and FLITCH BEAMS
have been sized using the Mitak
Beam Program V1.10 June 2011.

Unless otherwise stated the timber grade
for all lintels is S08. Lintels not shown
are to be selected as per NZS3604, 2011.

**All internal walls shown hatched on this layout are considered to be loadbearing
Lintel fixing specification remains the responsibility of the architect / draughtsperson**



MiTek New Zealand Limited

Correspondence from : **AUCKLAND**
40 Neales Road, East Tamaki 2013
PO Box 58-014, Botany 2163
Phone: 09 274 7109
Fax: 09 274 7100

CHRISTCHURCH
14 Pitkington Way, Wigram 8042
PO Box 8387, Riccarton 8440
Phone: 03 348 8691
Fax: 03 348 0314

MiTek 2020 Engineering 4.7.301.0

www.mitek.nz.co.nz

Printed: 08:59:38 18 Sep 2019

PRODUCER STATEMENT for MiTek 20/20[®] TRUSS DESIGN - Version 4.7

ISSUED BY: **MiTek New Zealand Limited**

TO: **CARTERS**

IN RESPECT OF: **MiTek[®] Truss Designs**

This producer statement covers the MiTek 20/20[®] truss design and the structural performance of the GANG-NAIL[®] connector plate for the job reference **267122C2** and may be used by a Building Consent Authority to assist in determining compliance with the New Zealand Building Code.

The MiTek 20/20[®] truss design program has been developed by MiTek New Zealand Limited for the design of MiTek[®] timber roof, floor and attic trusses in New Zealand. The truss designs computed by MiTek 20/20[®] are prepared using sound and widely accepted engineering principles, and in accordance with compliance documents of the New Zealand Building Code and Verification Method B1/VM1; and internationally accepted standard ANSI/TPI 1 - 2002 as an alternative solution, to satisfy the requirements of Clause B1 of the New Zealand Building Code.

On behalf of MiTek New Zealand Limited, and subject to:

- i) All proprietary products meeting their performance specification requirements
- ii) The provision of adequate roof bracing and overall building stability
- iii) Correct selection and placement of GANG-NAIL connector plates
- iv) Correct input of Truss Design Data as shown in the Fabricator Design Statement for this job
- v) The design being undertaken by the accredited fabricator under the terms of the software licence
- vi) Timber is graded to the requirements of NZS 3603:1993
- vii) Minimum timber treatment for these MiTek[®] trusses shall be in accordance with B2/AS1 Table 1A and the relevant sections of NZS 3602:2003

I believe on reasonable grounds that the trusses, if constructed in accordance with the MiTek 20/20[®] truss design and shop drawings, will comply with the relevant provisions of the New Zealand Building Code.

MiTek New Zealand Limited holds a current policy of Professional Indemnity Insurance no less than \$500,000.

On behalf of MiTek New Zealand Limited,

Date: Wednesday, 18 September 2019

In Ling Ng, BE (Hons), CPEng, IntPE, MIPENZ (ID: 146585)
TECHNICAL SERVICES MANAGER, MiTek New Zealand Limited

CARTERS

Fabricator Design Statement Page 1

Job: 26T122G2

Client: GOURLAY HOMES LIMITED
Phone:

Sale: MARK LAM
16 OAKLAND PLACE
NGONGHATAHIA
ROTORUA

Description:
Building Consent for
info only (date 17/09/2019)

With New Zealand content

Phone: 06 350 12 1234 2019

MITEK FABRICATOR DESIGN STATEMENT

This statement is issued by MITEK accredited fabricator CARTERS, being licensed to use the MITEK 20/20[®] software, to the client listed above and may be used by the Building Consent Authority to assist in determining compliance with the New Zealand Building Code.

MITEK 20/20[®] TRUSS DESIGN DATA

The MITEK 20/20[®] computer design for this job is based on the following design parameters entered into the program. The Fabricator shall ensure that these job details are current and relevant to the project for the design of the MITEK[®] trusses.

Job Details

Importance Level: 2

Design Working Life: 50 years

Roof Truss

Timber Group: MSG8HDP H1.2

Pitch: 25.000 deg

Nominal Overhang: 500 mm

Roof

Material: Metal Tiles
Dead Load: 0.210 kPa
Restraints: 400 mm centres
Live Load: Q_u = 0.250 kPa
Q_c = 1.100 kN

Ceiling

Material: Gie 13mm Timber Battens
Dead Load: 0.200 kPa
Restraints: 600 mm centres
Live Load: Q_c = 1.400 kN

Wind

Area: High (44.0 m/s)
Pressure Coeff: C_{pe} = varies; C_{pi} = -0.30, 0.20

The minimum timber treatment for these MITEK[®] trusses shall be in accordance with B2/AS1 Table 1A and the relevant sections of NZS 3602:2003. The timber for these MITEK[®] trusses shall be graded to the requirements of NZS 3603:1993. Proprietary fixings and timber connectors shall be selected in accordance with NZS3604:2011 Section 4 - Durability.

Truss List

Legend: * = detail only, ? = input only, Tek = failed design, B = non certified, Unmarked trusses = designed successfully, LB = lateral bracing required, GB = gable brace required.

Truss	Qty	Span (mm)	Pitch (deg)	Spacing (mm)	Truss	Qty	Span (mm)	Pitch (deg)	Spacing (mm)	Truss	Qty	Span (mm)	Pitch (deg)	Spacing (mm)
CGT1	1	6200	25.000	900	J2A	2	1877	25.000	900	V1	1	1055	25.000	900
GT1	1	10300	25.000	900 LB	J4	1	3327	25.000	900	V2	1	850	25.000	900
GT2	1	4800	25.000	900	J4A	1	3327	25.000	900	V3	1	1850	25.000	900
GT2A	1	4800	25.000	900	J4B	1	3327	25.000	900	V4	2	748	25.000	900
GT4	1	3678	25.000	900	J4C	1	3327	25.000	900	V5	1	1649	25.000	900
GT5	1	3277	25.000	900	J5	1	2427	25.000	900	V6	1	935	25.000	900
GT6	1	3855	25.000	900	J5A	1	2427	25.000	900	V7	1	1835	25.000	900
GT7	1	3855	25.000	900	J6	1	1527	25.000	900	V8	1	2735	25.000	900
HTG1	1	4580	25.000	900	J6A	1	1527	25.000	900	V9	1	1858	25.000	900
J3	1	4227	25.000	900	J7	1	2205	25.000	900	V10	1	958	25.000	900
T1	4	6928	25.000	900	J7A	1	2205	25.000	900	*ET1	1	5900	25.000	900
T2	3	10300	25.000	900	J8	1	882	25.000	900	*HB1	2	7300	18.249	900
T2A	3	10300	25.000	900	J8A	1	882	25.000	900	*HB2	1	1232	18.249	900
TG1	1	9200	25.000	900	J9	1	2377	25.000	900	*HB3	1	8077	18.249	900
TG2	1	3078	25.000	900	J8A	1	2377	25.000	900	*HB4	1	4132	18.249	900
CJ1	1	2463	25.000	900	J8B	1	2377	25.000	900	*HB5	1	3815	18.249	900
CJ1A	1	2463	25.000	900	J9C	2	2377	25.000	900	*HB6	3	4188	18.249	900
CJ1B	1	2463	25.000	900	J10	2	1477	25.000	900	*HB7	1	5286	18.249	900
CT1	1	6200	25.000	900	J10A	1	1477	25.000	900	*R1	2	1588	25.000	900
CT2	1	6200	25.000	900	J10B	1	1477	25.000	900	*R2	12	891	25.000	900
GT3	1	2778	25.000	900	J10C	2	1477	25.000	900	*R4	1	1218	25.000	900
HT1	1	1802	25.000	900	J11	1	1277	25.000	900	*R5	3	1168	25.000	900
HT2	1	1802	25.000	900	J12	1	1377	25.000	900	*R6	1	1044	25.000	900
	2	2777	25.000	900	R3	1	1105	25.000	900	*R7	1	705	25.000	900
	2	2777	25.000	900	T3	2	6300	25.000	900	*R8	1	867	25.000	900
J1B	1	2777	25.000	900	T4	1	3855	25.000	900	*R9	1	6960	25.000	900
J1C	1	2777	25.000	900	T5	2	1802	25.000	900	*R10	1	1058	18.249	900
J1D	1	2777	25.000	900	TR1	1	6928	25.000	900					
J2	2	1877	25.000	900	TR2	1	3078	25.000	900					

Total quantity : 119

The computer design input has been carried out by:

MITEK 20/20 Software Operator: David Shaw

MITEK Candidate Number and Qualifications:

Accredited Fabricator:



Wednesday, 18 September 2019

CARTERS

Slab Thickening Report - Page 1

Job: 28752202

Client: GOURLAY HOMES LIMITED
Phone:

Site: MARK LAM
16 OAKLAND PLACE
NGONGHATARA
ROTORUA

Description:
Building Consent No:
Ref: 28752202 (Engineering & Design)

MITek New Zealand Limited

Phone:

Printed: 28/02/2020 10:30:00

TRUSS BEARINGS EXCEEDING 10KN REPORT - Ultimate Limit State Loads

MITek[®] Truss List

Legend: ? = input only, ~~Fail~~ = failed design, ~~Q~~ = non certified, Unmarked trusses = designed successfully

Critical Trusses	Qty	Span (mm)	Joint	Bearing Reactions (kN)	
				Down	Uplift
GT1	1	10300	Q	11.395	12.448
TG1	1	6200	Q	8.885	11.003

Note:

†) Select appropriate Slab Thickening Detail from the MITek 'Internal Load Bearing On Concrete Floor Slabs' brochure.

DESIGN CERTIFICATE

COUNCIL
COPY

Technical basis for structural design methodology contained in designIT for houses - New Zealand.

designIT for houses, New Zealand has been developed by experienced timber engineers to assist designers in selecting appropriate sizes of structural laminated veneer lumber products manufactured by Carter Holt Harvey LVL Limited (including hySPAN, hy90, hyONE and hyJOIST) and other generic stress grades of timber, to be used as structural elements for the construction of buildings that fall within the scope of NZS 3604.

The design methodology used for the software complies with the loading and general design requirements contained within AS/NZS 1170 and with timber structural design in accordance with NZS 3603:1993 including Amendment 4 (Verification method B1/VM1, 6.1).

designIT relies on the accurate input of span and loading information by the user. Where accurate inputs are submitted the product and/or stress grade and the size given will comply with the structural requirements of the New Zealand Building Code (NZBC), provided the installation is in accordance with the installation requirements provided by designIT and/or in product literature and/or NZS 3604, or specific engineering design, as appropriate.

Futurebuild LVL and SG8 components, when used and treated to the required treatment levels prescribed in NZS 3602 and NZS 3604, as modified by Acceptable Solution B2/AS1, will comply with the requirements of the NZBC (Acceptable Solution B2/AS1, 3.2).

References:

1. NZS 3603:1993 Timber Structures Standard.
2. NZS 3604:2011 Timber-framed buildings.
3. AS/NZS 1170:2002 Structural design actions, Parts 0 and 1.
4. AS/NZS 1170:2011 Structural design actions, Part 2: Wind actions.
5. AS/NZS 1170:2003 Structural design actions, Part 3: Snow and ice actions.
6. AS 1720.1:2010 Timber structures. Part 1: Design methods.
7. AS 1720.3:2016 Timber structures. Part 3: Design criteria for timber-framed residential buildings.

This Design Certificate, and any associated warranty/certification, is void where there has been substitution of alternate products not detailed within the Member Specification.

Version date: 14 October 2019

For further information or advice contact:

Carter Holt Harvey LVL Limited,
173 Captain Springs Road, Onehunga, Auckland
Telephone: 0800 808 131
Email: designit@futurebuild.co.nz
Web: <https://futurebuild.co.nz/>

Specifier details:

Specifier: JWD
Business name: Bishop Architecture
Email: jobs@bishoparch.co.nz

Project & site details:

Project: Gourlay Home - Mark Lam
Reference: GH84
Site address: 16 Oakland Place Ngongotaha Rotorua
For (owner/s): Mark Lam
Design wind zone: High
Snow loading: Design snow zone: N1, Altitude: 0 m (sub-alpine), Ground snow load, $S_g^{1,2} = 0.0 \text{ kPa}$

1. designIT does not include any allowance for the effects of drifting and sliding of snow.
2. Snow loads are applied to roofed over structures only; the design of exposed floors/decks are not covered by designIT.

MEMBER DESIGN DETAILS

Member 1

1) Member code and description: Garage Door Lintel -- Lintels - In single or upper storey load bearing walls

- 2) Date prepared 24 January 2020
- 3) Serviceability criteria AS 1720.1: 2010 and AS 1720.3: 2016
- 4) Design inputs
- | | |
|------------------------|---|
| Span | 4.8 m |
| Roof load width 'RLW' | 0.9 m |
| Roof type and mass | Light roof and ceiling - 40 kg/m ² |
| Nominal wall thickness | 90 mm |
- 5) Member specification
- | | |
|----------------------------|---|
| Size, stress grade/product | Use 2/290 x 45 SG8 |
| Material type | Dry softwood, machine stress-graded and verified (NZS 3622) |
| Assumed design density | < 480 kg/m ³ |

6) Serviceability

Load case	Limit ³ on average deflection ²	Estimated average deflection ²	Rigidity ratio ⁴
Long term load - $G + \Psi_L Q^*$	10.0 mm	6.4 mm (long term)	1.6
Live load - $\Psi_c Q$	15.0 mm	1.5 mm	10.2
Wind load - W_s	24.0 mm	4.4 mm	5.4

*Critical serviceability load case

See 'Notes for interpretation of serviceability data' at the end of this report.

7) Reactions

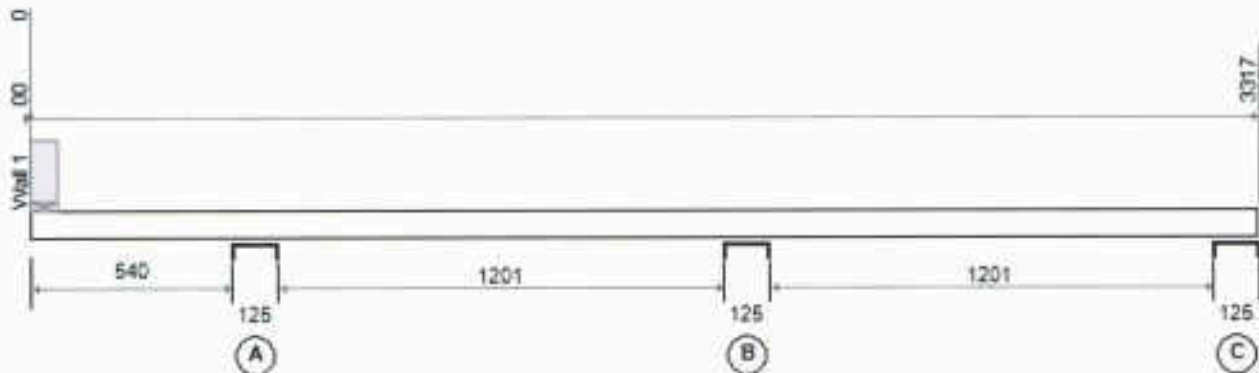
Load case	kN ³	Limit States Design Reaction ^{2,3}
		End kN ⁴
1.35G	0.60	-1.7
1.2G + 1.5Q	0.60	-2.3
1.2G + W_u + $\Psi_c Q$	1.00	-3.2
0.9G + W_u	1.00	1.6

8) Installation requirements

- Provide at least 30 mm bearing at end supports

Member 2

- 1) Member code and description
- | | |
|--------|---|
| Spar/s | B1 - supporting single or upper storey load bearing walls.
See drawing under Loading & support |
|--------|---|
- 2) Date prepared 28 January 2020
- 3) Serviceability criteria AS 1720.1: 2010 and AS 1720.3: 2016
- 4) Loading and support



			Load width/area	Dead load	Live load
Direct loading					
UDL	0 - 3317	Floor	2.76 m	100 kg/m ²	1.5 kPa/1.8 kN
From perpendicular walls					
Wall A at	45	Wall	2.8 m	0.4 kN/m	
		Roof	2.755 x 1.0 m ²	40 kg/m ²	0.25 kPa

5) Member specification

Size, stress grade/product

Use 2/150 x 45 hySPAN

Material type

Structural Laminated Veneer Lumber to AS/NZS 4357

6) Serviceability

Load case	Limit ² on average deflection ²	Estimated average deflection ³	Rigidity ratio ⁴
Long term load - $G + \Psi_L Q^*$	4.2 mm	0.6 mm (long term)	7.0
Live load - $\Psi_S Q$	3.5 mm	0.2 mm	15.5
Live load - $\Psi_S Q$	3.5 mm	0.2 mm	16.4
Live load - $\Psi_S Q$	3.5 mm	0.2 mm	17.3
Live load - $\Psi_S Q$	3.5 mm	0.2 mm	17.3
Live load - $\Psi_S Q$	7.0 mm	-0.1 mm	81.5
Overhang			
Long term load - $G + \Psi_L Q^*$	3.8 mm	2.8 mm (long term)	1.4
Live load - $\Psi_S Q$	3.2 mm	0.6 mm	5.4
Live load - $\Psi_S Q$	3.2 mm	0.3 mm	11.2
Live load - $\Psi_S Q$	3.2 mm	1.8 mm	1.8

*Critical serviceability load case

See 'Notes for interpretation of serviceability data' at the end of this report

7) Reactions

Load case	k_1 ¹	Reaction kN ⁴
Support A/End		
1.35G	0.60	-11.7
1.2G + 1.5Q	0.80	-15.9
1.2G + 1.5Q	0.94	-13.5
1.2G + W_{u1} + $\Psi_{c1} Q$	1.00	-11.1
0.8G + W_{u1}	1.00	-1.0
Support B/Internal		
1.35G	0.60	-6.3
1.2G + 1.5Q	0.80	-13.5

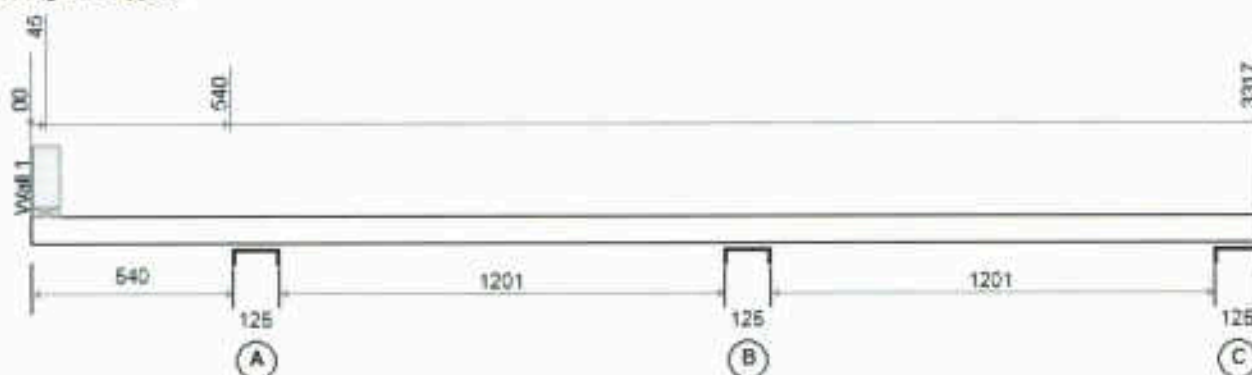
1.2G + 1.5Q	0.80	-3.8
1.2G + W _U + Ψ _c Q	1.00	-2.2
0.9G + W _U	1.00	-4.7
Support C/End		
1.35G	0.60	-3.3
1.2G + 1.5Q	0.80	-5.4
1.2G + 1.5Q	0.94	-2.4
1.2G + W _U + Ψ _c Q	1.00	-2.3
0.9G + W _U	1.00	-1.2

B) Installation requirements

- Vertical lamination in accordance with Detail H1.

Member 3

- Member code and description**
Span/s
B2 - supporting single or upper storey load bearing walls.
See drawing under Loading & support
- Date prepared**
28 January 2020
- Serviceability criteria**
AS 1720.1: 2010 and AS 1720.3: 2016
- Loading and support**



			Load width/area	Dead load	Live load
Direct loading					
UOL	0 - 540	Floor	1.23 m	100 kg/m ²	2.0 kPa/1.8 kN
UOL	540 - 3317	Floor	1.23 m	100 kg/m ²	1.5 kPa/1.8 kN
From perpendicular walls					
Wall A at	45	Wall	1.2 m	0.4 kN/m	
		Roof	1.232 x 1.0 m ²	40 kg/m ²	0.25 kPa

5) Member specification

- Size, stress grade/product Use 2/150 x 45 hySPAN
- Material type Structural Laminated Veneer Lumber to AS/NZS 4357

6) Serviceability

Load case	Limit ¹ on average deflection ²	Estimated average deflection ²	Rigidity ratio ⁴
Long term load - G + Ψ _L Q ³	4.2 mm	0.3 mm (long term)	15.2
Live load - Ψ _S Q	3.5 mm	0.1 mm	34.8

Live load - $\Psi_S Q$	3.5 mm	0.1 mm	36.9
Live load - $\Psi_N Q$	3.5 mm	0.1 mm	38.7
Live load - $\Psi_S Q$	3.5 mm	0.1 mm	38.7
Live load - $\Psi_N Q$	7.0 mm	0.0 mm	182.2
Overhang			
Long term load - $G + \Psi_L Q^*$	3.8 mm	1.3 mm (long term)	2.8
Live load - $\Psi_S Q$	3.2 mm	0.3 mm	9.1
Live load - $\Psi_N Q$	3.2 mm	0.1 mm	25.1
Live load - $\Psi_S Q$	3.2 mm	0.8 mm	4.0

*Critical serviceability load case

See 'Notes for interpretation of serviceability data' at the end of this report

7) Reactions

Load case	kt^3	Reaction kN ⁴
Support A/End		
1.35G	0.60	-5.6
1.2G + 1.5Q	0.80	-7.8
1.2G + 1.5Q	0.94	-6.0
1.2G + $W_U + \Psi_C Q$	1.00	-5.0
0.9G + W_U	1.00	-0.4
Support B/Internal		
1.35G	0.60	-2.7
1.2G + 1.5Q	0.80	-5.8
1.2G + 1.5Q	0.80	-1.5
1.2G + $W_U + \Psi_C Q$	1.00	-1.0
0.9G + W_U	1.00	-2.1
Support C/End		
1.35G	0.60	-1.5
1.2G + 1.5Q	0.80	-2.4
1.2G + 1.5Q	0.94	-1.1
1.2G + $W_U + \Psi_C Q$	1.00	-1.0
0.9G + W_U	1.00	-0.5

8) Installation requirements

- * Vertical lamination in accordance with Detail H1.

Notes for interpretation of serviceability data

1. 'average deflection' is an engineering concept based upon a notional estimated load, notional member rigidity and, in some cases, an approximate model of material response to environmental conditions. These parameters are, 'standardised' in AS 1170 and AS 1720.

2. Deflection is the flexural response to load 'out-of-level' measurements of installations are not necessarily deflections and can incorporate 'initial out-of-straightness', whether intended or not. Furthermore, loads can be higher/lower than the notional estimate and in any comparison with measured levels, material variability needs to also be considered. AS 1720 gives the following basis for estimation of upper bound deflections for various materials.

No 1 Framing – visually graded to NZS 3631	Average + 100%
SG grades – mechanically graded to AS/NZS 1748	Average + 43%
GL grades for glulam to AS 1328	Average + 33%
LVL to AS/NZS 4357 (includes hySPAN and hyJOIST)	Average + 18%

As can be seen, comparison of the 'average deflection' for different materials, even if calculated on the same basis, does not give the whole picture!

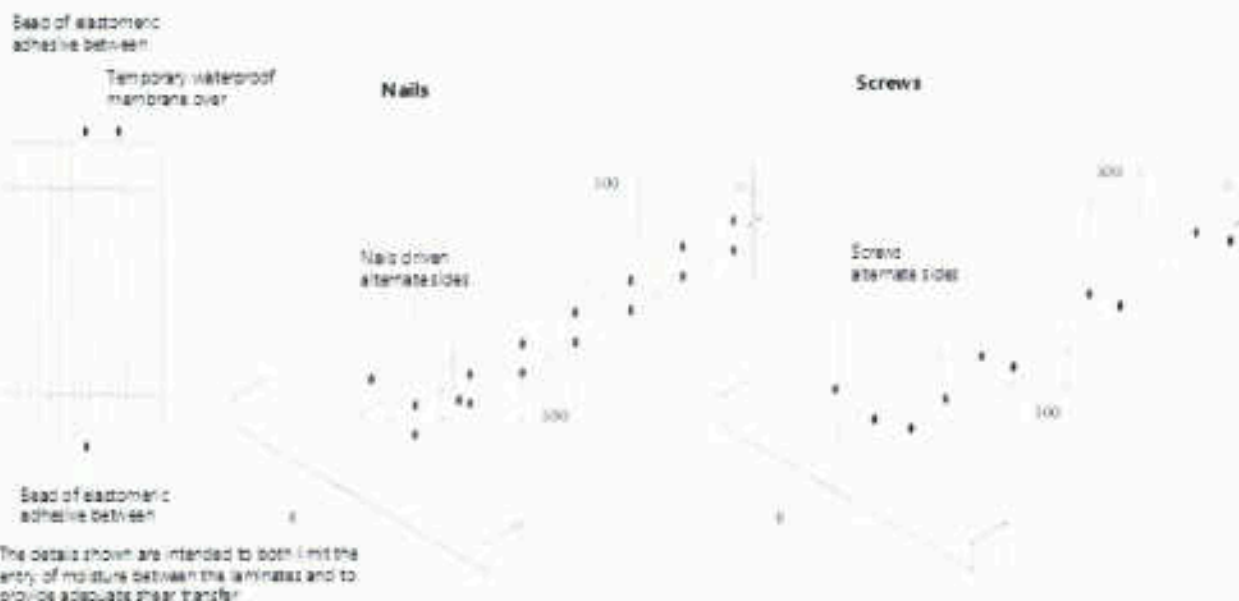
3. The limits referred are those specified in AS 1720.3 for the stated load case.

4. 'Rigidity ratio' expresses the rigidity of the specified beam relative to the rigidity of a notional beam just meeting the serviceability requirements detailed.

Notes for interpretation of reaction data

1. Duration of load factor 'k₁' for strength as per NZS 3603:1993
2. Negative (-) reactions relate to the 'gravity' or 'downwards' force on the support
3. Positive reactions relate to the 'upwards' forces or 'tie-down' requirement on the support
4. End reaction includes allowance for overhang/cantilever where one has been designed

Detail H1: Vertical Lamination - Two Pieces



Section Size 'B'	Minimum Nail Diameter	Minimum Nail Length	Minimum Screw Gauge	Minimum Screw Length
35	3.06 mm	75 mm	-	-
45	3.30 mm	90 mm	14 g	75 mm
63	3.30 mm	100 mm	14 g	100 mm
90	-	-	14 g	150 mm

DESIGN CERTIFICATE

Technical basis for structural design methodology contained in designIT for houses - New Zealand.

designIT for houses, New Zealand has been developed by experienced timber engineers to assist designers in selecting appropriate sizes of structural laminated veneer lumber products manufactured by Carter Holt Harvey LVL Limited (including hySPAN, hy90, hyONE and hyJOIST) and other generic stress grades of timber, to be used as structural elements for the construction of buildings that fall within the scope of NZS 3604.

The design methodology used for the software complies with the loading and general design requirements contained within AS/NZS 1170 and with timber structural design in accordance with NZS 3603:1993 including Amendment 4 (Verification method B1/VM1, 6.1).

designIT relies on the accurate input of span and loading information by the user. Where accurate inputs are submitted the product and/or stress grade and the size given will comply with the structural requirements of the New Zealand Building Code (NZBC), provided the installation is in accordance with the installation requirements provided by designIT and/or in product literature and/or NZS 3604, or specific engineering design, as appropriate.

Futurebuild LVL and SGB components, when used and treated to the required treatment levels prescribed in NZS 3602 and NZS 3604, as modified by Acceptable Solution B2/AS1, will comply with the requirements of the NZBC (Acceptable Solution B2/AS1, 3.2).

References:

1. NZS 3603:1993 Timber Structures Standard.
2. NZS 3604:2011 Timber-framed buildings.
3. AS/NZS 1170:2002 Structural design actions, Parts 0 and 1.
4. AS/NZS 1170:2011 Structural design actions, Part 2: Wind actions.
5. AS/NZS 1170:2003 Structural design actions, Part 3: Snow and ice actions.
6. AS 1720.1:2010 Timber structures, Part 1: Design methods.
7. AS 1720.3:2016 Timber structures, Part 3: Design criteria for timber-framed residential buildings.

This Design Certificate, and any associated warranty/certification, is void where there has been substitution of alternate products not detailed within the Member Specification.

Version date: 8 February 2019

For further information or advice contact:

Carter Holt Harvey LVL Limited,
173 Captain Springs Road, Onehunga, Auckland
Telephone: 0800 808 131
Email: designit@futurebuild.co.nz
Web: <https://futurebuild.co.nz/>

Specifier details:

Specifier:	JWD
Business name:	Bishop Architecture
Email:	jobs@bishoparch.co.nz

Project & site details:

Project:	New Gourlay Home
Reference:	GH84
Site address:	16 Oaklands Place Ngongotaha Rotorua
For (owner/s):	Mark Lam
Design wind zone	High
Snow loading	Design snow zone: N1, Altitude: 0 m (sub-alpine), Ground snow load, $S_g^{1,2} = 0.0$ kPa

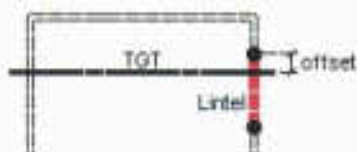
1. designIT does not include any allowance for the effects of drifting and sliding of snow.

2. Snow loads are applied to roofed over structures only, the design of exposed floors/decks are not covered by designIT.

MEMBER DESIGN DETAILS

Member 1

1) Member code and description	w09w - Lintels - Supporting girder truss / truncated girder truss
--------------------------------	---



- 2) Date prepared 10 October 2019
- 3) Serviceability criteria AS 1720.1: 2010 and AS 1720.3: 2016

- 4) Design inputs
- | | |
|------------------------|---|
| Roof type | Light roof and ceiling - 40 kg/m ² |
| Roof pitch | 25.0 ° |
| Truss spacing | 900 mm |
| Eaves overhang | 600 mm |
| TGT span | 5390 mm |
| TGT setback | 2690 mm |
| TGT offset | 1790 mm |
| Lintel span | 2400 mm |
| Nominal wall thickness | 90 mm |

- 5) Member specification
- | | |
|----------------------------|---|
| Size, stress grade/product | Use 2/240 x 45 SG8 |
| Material type | Dry softwood, machine stress graded and verified (NZS 3622) |
| Assumed design density | < 480 kg/m ³ |

6) Serviceability

Load case	Limit ² on average deflection ²	Estimated average deflection ²	Rigidity ratio ⁴
Long term load - $G + \Psi_L Q^*$	8.0 mm	2.4 mm (long term)	3.3
Live load - $\Psi_S Q$	9.8 mm	0.7 mm	13.3
Wind load - W_s	12.0 mm	2.2 mm	5.5

*Critical serviceability load case

See 'Notes for interpretation of serviceability data' at the end of this report

7) Reactions

Load case	k ₁ ¹	Limit States Design Reaction ^{2,3}
		End kN ⁴
1.35G	0.60	-2.8
1.2G + 1.5Q	0.60	-4.3
1.2G + $W_u + \Psi_S Q$	1.00	-6.0
0.9G + W_u	1.00	3.8

- 8) Installation requirements
- Provide at least 30 mm bearing at end supports
 - Nail lamination required - refer AS 1684

Member 2

- 1) Member code and description w14e - Lintels - Supporting girder truss / truncated girder truss



- 2) Date prepared 10 October 2019
- 3) Serviceability criteria AS 1720.1: 2010 and AS 1720.3: 2010

- 4) Design inputs
- Roof type Light roof and ceiling - 40 kg/m²
 - Roof pitch 25.0 °
 - Truss spacing 900 mm
 - Eaves overhang 600 mm
 - TGT setback 4200 mm
 - GT span 5000 mm
 - GT offset 1500 mm
 - Lintel span 2000 mm
 - Nominal wall thickness 90 mm

- 5) Member specification
- Size, stress grade/product Use 2/240 x 45 SG8
 - Material type Dry softwood, machine stress graded and verified (NZS 3622)
 - Assumed design density < 480 kg/m³

6) Serviceability

Load case	Limit ¹ on average deflection ²	Estimated average deflection ³	Rigidity ratio ⁴
Long term load - G + $\Psi_L Q$	6.7 mm	1.6 mm (long term)	3.6
Live load - $\Psi_S Q$	8.0 mm	0.6 mm	14.2
Wind load - W_s	10.0 mm	1.7 mm	5.9

¹Critical serviceability load case

See 'Notes for interpretation of serviceability data' at the end of this report

7) Reactions

Load case	k _t ¹	Link States Design Reaction ^{2,3}
		End kN ⁴
1.35G	0.60	-3.6
1.2G + 1.5Q	0.80	-5.7
1.2G + W _u + $\Psi_c Q$	1.00	-8.0
0.9G + W _u	1.00	5.1

8) Installation requirements

- Provide at least 30 mm bearing at end supports
- Nail lamination required - refer AS 1684

Member 3

1) Member code and description

w18e - Lintels - Supporting girder truss / truncated girder truss



2) Date prepared

10 October 2019

3) Serviceability criteria

AS 1720.1: 2010 and AS 1720.3: 2016

4) Design inputs

Roof type	Light roof and ceiling - 40 kg/m ²
Roof pitch	25.0°
Truss spacing	900 mm
Eaves overhang	300 mm
TGT setback	2700 mm
GT span	6110 mm
GT offset	1200 mm
Lintel span	1800 mm
Nominal wall thickness	90 mm

5) Member specification

Size, stress grade/product	Use 2/240 x 45 SG8
Material type	Dry softwood, machine stress graded and verified (NZS 3622)
Assumed design density	< 480 kg/m ³

6) Serviceability

Load case	Limit ¹ on average deflection ²	Estimated average deflection ²	Rigidity ratio ⁴
Long term load - $G + \Psi_L Q^*$	6.0 mm	1.2 mm (long term)	5.0
Live load - $\Psi_L Q$	7.2 mm	0.4 mm	19.6
Wind load - W_s	9.0 mm	1.1 mm	8.1

*Critical serviceability load case

See 'Notes for interpretation of serviceability data' at the end of this report

7) Reactions

Load case	k ¹	Limit States Design Reaction ^{2,3}
		End kN ⁴
1.35G	0.60	-2.7
1.2G + 1.5Q	0.80	-4.2
1.2G + W_{Lx} + $\Psi_{Lx} Q$	1.00	-5.9
0.9G + W_{Lx}	1.00	3.8

8) Installation requirements

- + Provide at least 30 mm bearing at end supports

- Nail lamination required - refer AS 1684

Notes for interpretation of serviceability data

1. 'average deflection' is an engineering concept based upon a notional estimated load, notional member rigidity and, in some cases, an approximate model of material response to environmental conditions. These parameters are 'standardised' in AS 1170 and AS 1720.

2. Deflection is the flexural response to load 'out-of-level' measurements of installations are not necessarily deflections and can incorporate 'initial out-of-straightness', whether intended or not. Furthermore, loads can be higher/lower than the notional estimate and in any comparison with measured levels, material variability needs to also be considered. AS 1720 gives the following basis for estimation of upper bound deflections for various materials.

No 1 Framing – visually graded to NZS 3631	Average + 100%
SG grades - mechanically graded to AS/NZS 1748	Average + 43%
GL grades for glulam to AS 1328	Average + 33%
LVL to AS/NZS 4357 (includes hySPAN and hyJOIST)	Average + 18%

As can be seen, comparison of the 'average deflection' for different materials, even if calculated on the same basis, does not give the whole picture!

3. The limits referred are those specified in AS 1720.3 for the stated load case.

4. 'Rigidity ratio' expresses the rigidity of the specified beam relative to the rigidity of a notional beam just meeting the serviceability requirements detailed.

Notes for interpretation of reaction data

1. Duration of load factor 'k₁' for strength as per NZS 3603:1993
2. Negative (-) reactions relate to the 'gravity' or 'downwards' force on the support
3. Positive reactions relate to the 'upwards' forces or 'tie-down' requirement on the support
4. End reaction includes allowance for overhang/cantilever where one has been designed

O'BRIEN GEOTECH^{LTD}

Geotechnical Assessment for Proposed New House

16 Oakland Place, Ngongotaha, Rotorua

For Mark Lam

Rev A

Project No 583

April 2019

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1 Introduction

O'Brien Geotech Ltd has been engaged by Mark Lam to undertake a geotechnical assessment for a proposed new house at 16 Oakland Place, Ngongotaha. This report outlines the investigations undertaken, the analysis carried out and provides recommendations on the foundation aspects of the proposed development.

2 Site Description

The site is located in Stage 2 of the Oakland Subdivision in Ngongotaha, approximately 1.5km from the lake. The site location is shown on Figure A below. It is legally described as Lot 70 DP 389915 and has an area of 1143m².



Figure A: Site Location

Photograph from RLDC GIS System

The site is located on relatively flat ground and, after the subdivision earthworks, had an elevation of approximately RL286m (Moturiki Datum). The site layout is shown on Figure B below.

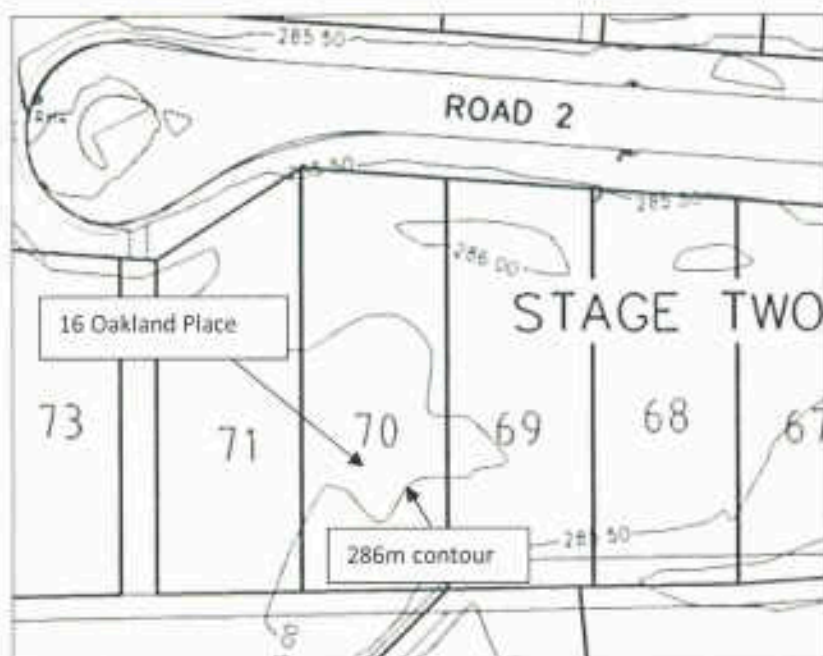


Figure B: Site Layout

Plan from T&T Assessment Report

3 Proposed Development

It is proposed to construct a single storey house with brick cladding and a lightweight roof. The house is to have an integral garage. The proposed building location is shown on Figure 1 in Appendix A.

4 Site History & Previous Reports

The Oakland Subdivision has been intensively investigated and assessed, since compressible soils were discovered by investigations undertaken in 2008. A Geotechnical Assessment Report¹ which relates to the Stage 2 and 3 of the subdivision was issued in 2009.

The Geotechnical Assessment Report outlines the results of an intensive programme of ground investigation, laboratory testing, site monitoring and assessment and provides general recommendations for construction on the subdivision.

The conclusions and recommendations concerning Lot 70 contained in the report are summarised below:

- The lot is underlain by approximately 6m of soft compressible silt
- Between 0.5m and 1m of cut was undertaken during the subdivision works. Refer to Fig C below.
- The assessment report included Lot 70 in Zone C – areas of cut overlying significant a thickness of soft silt.
- Stiffened rafts were recommended for Zone C lots.
- Settlement monitoring on Lot 68 (approximately 35m away) between July 2008 and January 2009 indicated minimal movement.
- 1m to 1.5m deep subsoil drains have been installed to lower the ground water level.

¹ Geotechnical Assessment Report, Volume 1 & 2; Ref 851126 produced by Tonkin & Taylor in March 2009.

- The ground water was recorded at 2.5m depth in December 08 and January 09.
- An enhanced damp proof membrane and a capillary break with perforated pipe connected to the stormwater disposal system is required.
- A maximum of 150mm of filling for patios or decks is allowed.
- No stockpiles of materials over 1m high and/or covering an area greater than 4m² are to be placed on or adjacent to the proposed building footprint or existing underground services.

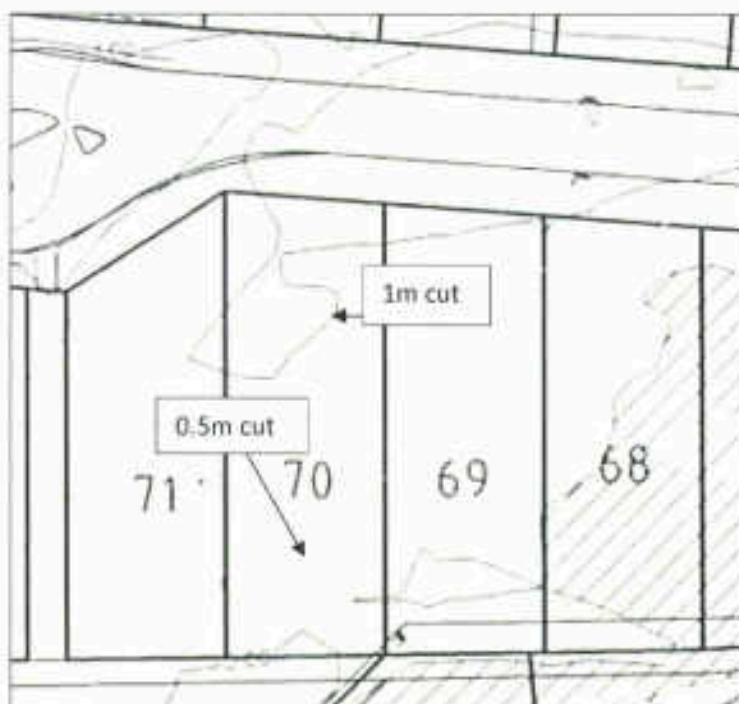


Fig C: Cut/Fill Plan

From Geotechnical Assessment Report

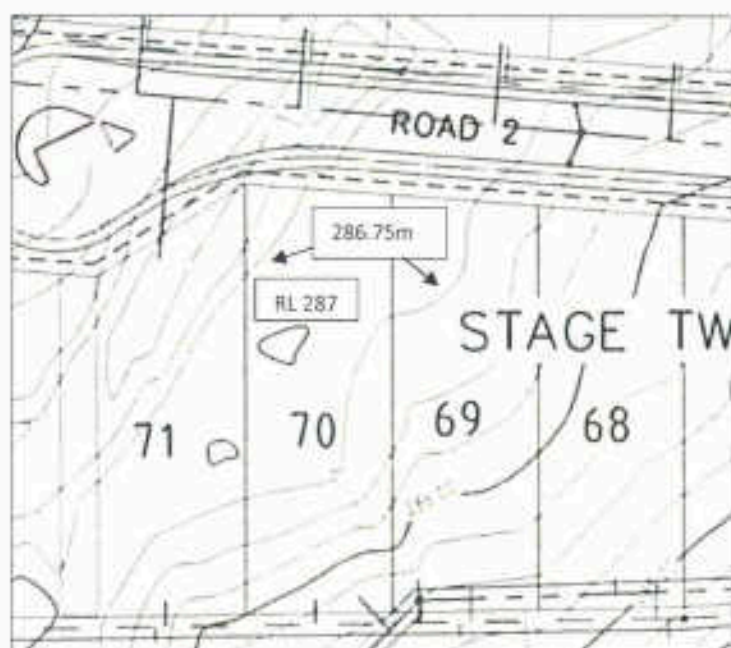


Fig D: Pre-development contours

From Geotechnical Assessment Report

Following a flooding event in April 2018, the council has advised that the required minimum Finished Floor Level are to be derived as follows:

- Timber Floor: $RL286.86m + 20mm + \text{thickness of joist} + \text{floorboards (not less than 225mm)}$
- Concrete Floor: $RL286.86m + 150mm$ for brick cladding, 225mm for weatherboard cladding, or slab thickness (whichever is greater)

It is understood that no allowance for future settlement has been included in these values. In garage areas a lower slab level can be used, however it should be noted that the council may place a Section 72 Notice on the title in this instance, concerning the flooding risk.

5 Ground Conditions

5.1 Published Geology

The published geology for the area² indicates that the site is underlain by Tauranga Group Alluvium.

5.2 Investigations Carried Out

Five handaugers and Scala Penetrometer Tests were undertaken in May 2017. In addition, two CPTs undertaken as part of previous investigations were referred to. The site investigation locations are shown on Figure 1 in Appendix A and Figure E below. The site investigation data is included in Appendix C.

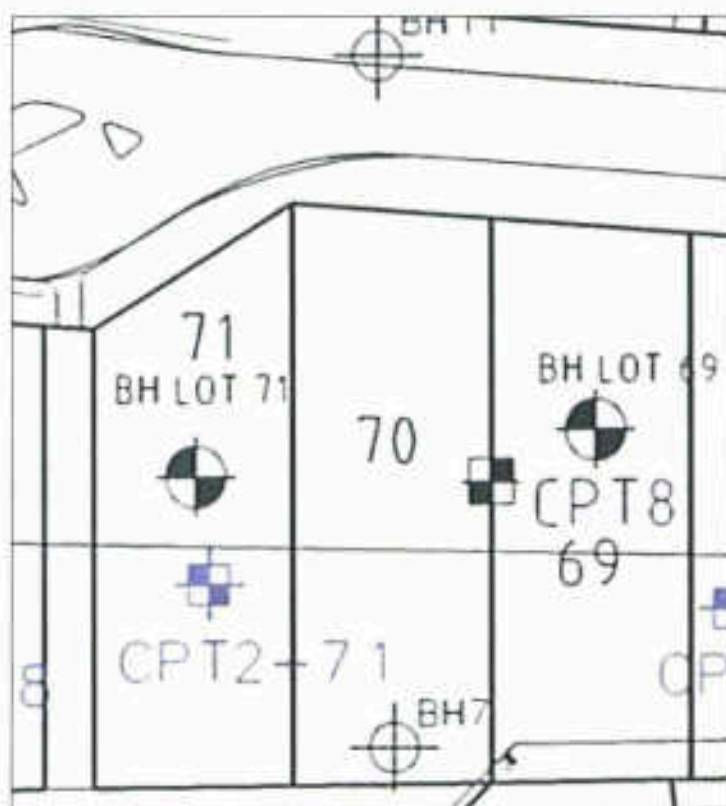


Fig E: CPT Locations from Geotechnical Assessment Report

² Geology of the Rotorua Area by Leonard et al GNS 2010.

5.3 Ground Conditions

The ground conditions encountered are summarised in Table 2 below:

Stratum	Description	Depth to Top of Stratum m	Stratum Thickness m	Typical qc mPa
1	Topsoil	-	0.1 to 0.35	N/A
2	Very stiff to hard SILT	0.2 to 0.35	0.4 to 0.6	6
3	Loose to medium dense sand, pumiceous	0.5 to 0.9	2 to 3	1 to 5
4	Very soft to soft SILT with sand layers	3 to 4	7 to 8	0.25
5	Medium dense to dense SAND	11	9+	4 to 14

The water table was measured at 2.1m depth in CPT 2-71 and was not encountered in the 2m depth of the handauger investigation.

Subsequent to the investigation unsuitable soils were excavated and replaced with approximately 400mm of compacted pumice. The compaction of the pumice was tested and was found to be acceptable (refer to Site Inspection Report in Appendix B). It is understood that the level of the top of the pumice fill is approximately 300mm below the original Finished Floor Level (RL286.25m). A current platform level of RL285.95m has therefore been assumed in this assessment.

6 Geotechnical Assessment

6.1 Discussion of Results of Investigation

The investigations confirm the presence of soft compressible silt and potentially liquefiable soils. The presence of a relatively competent crust has also been confirmed.

These matters are assessed below.

6.2 Liquefaction Assessment

6.2.1 Liquefaction Assessment Parameters

Recent alluvial soils are known to be potentially vulnerable to liquefaction. Liquefaction is the term used to describe the severe strength loss which can occur when saturated loose to medium dense granular soils and low plasticity silts are subject to seismic shaking. Liquefaction can also result in post seismic settlement, slope failure and in lateral movement toward free edges such as rivers or streams known as lateral spreading (not relevant for this site).

At this site, the water table has been measured at approximately 2m depth (CPT 2-71 undertaken in June 2008). An assessment of the effect of seismic shaking on this site has been undertaken using the computer

program Clq and the method of Idriss & Boulanger³ (I&B). The effects of clay-like behaviour under seismic shaking have also been assessed.

The proposed building is Importance Level (IL) 2 as defined by NZS 1170.0 2004 'New Zealand Standard for Structural Design Action'. The code requires that structures must avoid collapse as a result of an Ultimate Limit State Level (ULS) of shaking (500 year return period for IL 2 structures – i.e. 10% risk of occurrence within 50 years). It must be readily repairable after a Serviceability Limit State (SLS) level of shaking (25 year return period for IL2 structures – i.e. 87% risk of occurrence within 50 years).

The site has been assessed as being Class D 'Deep Soil Site' in accordance with NZS 1170.5 2004. From the New Zealand Bridge Manual⁴ a PGA of 0.3g and an earthquake magnitude of 6 has been adopted for ULS shaking. For SLS shaking a PGA of 0.075g has been used.

6.2.2 Results of Liquefaction Assessment

The liquefaction plots are included in Appendix D. The results indicate that liquefaction in the sands below the water table is expected under ULS shaking. A ground surface settlement of between 33 and 200mm is predicted. The predicted settlement from liquefaction within the top 10 m only reduces to between 10 and 40mm. A Liquefaction Severity Index (LSN) of 7 and 26 is indicated. No liquefaction is predicted under a SLS level of shaking.

It should be appreciated that the settlement prediction methods are approximate. The predicted settlement should therefore be considered to be an indicator of relative severity rather than an accurate prediction of the settlement which will occur.

The Liquefaction Severity Number (LSN) has been developed following the Canterbury earthquakes as a way of predicting the level of settlement related land and building damage which will occur from liquefaction. The LSN highlights the degree of liquefaction occurring close to the surface, which has been found to be a major contributor to land damage in Canterbury. A LSN value of 0 to 20 indicates little or no expression of liquefaction, minor sand boils, and minor damage to homes. A value between 20 and 40 indicates moderate expression of liquefaction, undulations and cracking of ground surface (there are occasional instances of severe damage). A value in excess of 40 indicates widespread damage, extensive expression of liquefaction, severe settlement of buildings and damage to services. The calculated LSN values for ULS shaking are 7 and 26, indicating a low to moderate level of damage can be expected.

6.3 Settlement Assessment

The design philosophy is to keep the building loads to below the weight of soil which was removed by the cutting of the site which was undertaken during the subdivision works. An examination of the pre-development levels indicates that, in the vicinity of the proposed house (northern and central part of the site), the original levels varied between 286.75m to 287m.

Conservatively assuming a typical pre-development level of 286.8m and an existing site level of 285.95m, indicates that 0.85m of cut has occurred. If a value of 14kN/m³ is adopted for the weight of the removed

³ Idriss I.M. & Boulanger R.W (2008) 'Soil Liquefaction During Earthquakes' monograph series No.MNO-12 Earthquake Engineering Research Institute.

⁴ The New Zealand Transport Bridge Manual SP/M/022, Third Edition, Amendment 1, Sept 2014

soil, a net load reduction of 12kPa at the house location is calculated. If the proposed house loads are less than this value minimal settlement can be expected.

A typical brick clad house with a light weight roof has an overall load of approximately 5 to 7kPa. Because of the high Finished Floor Level (FFL), additional brick height will be required. This has been estimated to add approximately 1kPa to 2kPa to the overall building weight. Provided polystyrene fill supporting a ground bearing slab or a suspended floor with a void underneath is used, the house loading will not exceed the previous load. Notwithstanding the above, it is considered prudent to allow a 50mm settlement allowance when determining the floor level.

6.4 Proposed Foundation Details

The Geotechnical Assessment Report proposes that a specifically designed cellular raft is required for a conventional brick construction. An enhanced damp proof membrane and a capillary break with a perforated pipe connected to the stormwater system is also proposed.

For a brick clad or weatherboard building on a ground bearing slab, 0.85m high H Grade 'Polyrock' polystyrene blocks (available from EPS Foam Ltd, Tauranga) shall be used. These shall be wrapped in polythene as per the manufacturer's recommendations and shall be encased in masonry or brick side walls founded on strip foundations. Fine pumice fill shall be used to fill the gap between the top of the blocks and the underside of the slab. Because of the stiffening effect of the side walls, a standard 'Ribraft' type floor is considered to be sufficient for the areas with the high level concrete slab. The slab shall be monolithic with or built into the side walls. The strip foundations shall be designed assuming an Ultimate Geotechnical Bearing Capacity of 300kPa. Ultimate loads and a strength reduction factor of 0.5 shall be used with this value.

The garage floor can be constructed at the existing platform level. An enhanced 'Ribraft' type foundation is proposed for the garage slab. The details shall comply with Option 4 of the TC2 solutions, as outlined in the guidelines for the Canterbury rebuild³. The garage shall have brick or masonry walls extending at least up to the anticipated flood level. All electrical sockets shall be located above the flood level.

Alternatively, a weatherboard house with a suspended timber floor (with under-floor void) can be used, provided the floor level is set at the required level. The garage floor shall be constructed as outlined above.

Apart from the filling outlined above, no additional filling shall be undertaken without approval from a geotechnical engineer.

The foundations and the superstructure shall be designed to withstand differential settlement of up to 25mm in 6m. Sufficient movement joints shall be incorporated into the building fabric to accommodate this level of differential settlement.

The proposed foundation details shall be developed by a structural engineer and shall be reviewed by a geotechnical engineer. The structural engineer shall determine if dowel piles are required in the garage. The damp proofing, capillary break and subsoil drain requirements outlined in the Tonkin & Taylor report (and included in Appendix A) will apply to the garage slab only.

³ Revised guidelines on repairing and rebuilding houses affected by the Canterbury earthquakes sequence – MBIE (December 2012)

7 Conclusions and Recommendations

The investigation and assessment undertaken has confirmed that the site is suitable for the proposed development.

The house floor level shall be determined from the flood level quoted in Section 4 above. A 50mm settlement allowance shall be added. It is recommended that legal advice should be obtained concerning the implications of a Section 72 Notice, which the council may place on the property if a low level garage slab is incorporated into the design.

Recommendations on suitable foundation and construction details are given in Section 6.4 above.

As a considerable amount of time has elapsed since the pumice fill was placed, prior to construction the formation (and any foundation excavations) shall be inspected by a geotechnical engineer to ensure that no loose surface soils are present.

Unless specifically excluded above, the requirements outlined in Section 4 above shall still be deemed to apply.

8 Applicability

This report has been prepared for the benefit of Mark Lam with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

The proposed liquefaction mitigation measures are intended to meet the code requirements, i.e. to prevent the collapse of the structures under ULS level shaking. It should be appreciated that extensive damage could occur, which may result in the subsequent demolition of the building.

Recommendations and opinions in this report are based on data obtained from a limited number of investigation locations. The nature and continuity of the ground away from these locations is inferred but it must be appreciated that actual conditions may vary from the assumed model.

O'Brien Geotech Ltd can accept no responsibility for the accuracy of geotechnical data obtained from independent contractors such as Geotechnics Ltd and Perry Geotech Ltd.

During excavation and construction, the site should be examined by an engineer or engineering geologist competent to judge whether the exposed subsoils are compatible with the inferred conditions on which the report has been based. It is important that we be contacted if there is any variation in subsoil conditions from those described in the report.

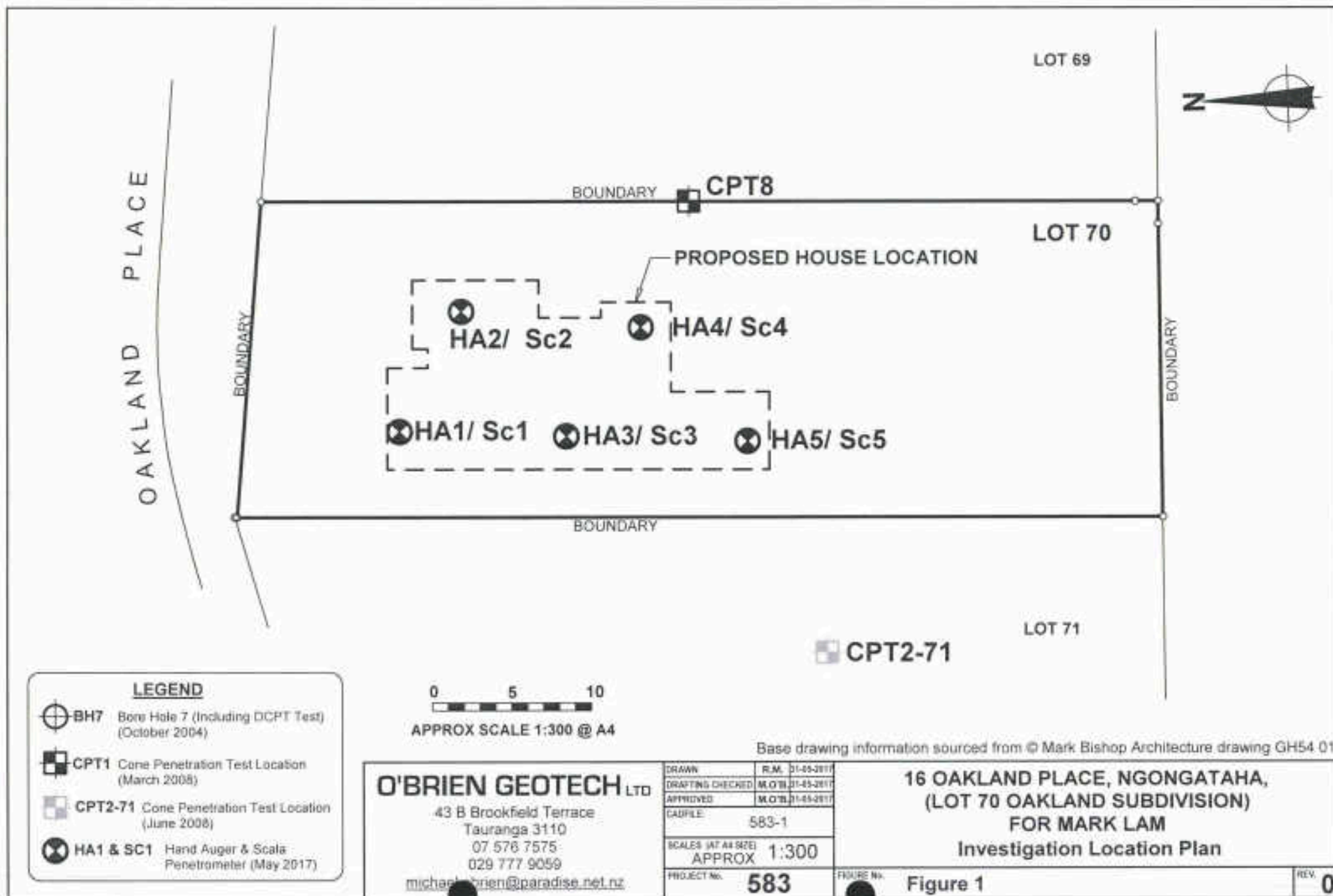
For O'Brien Geotech Ltd,

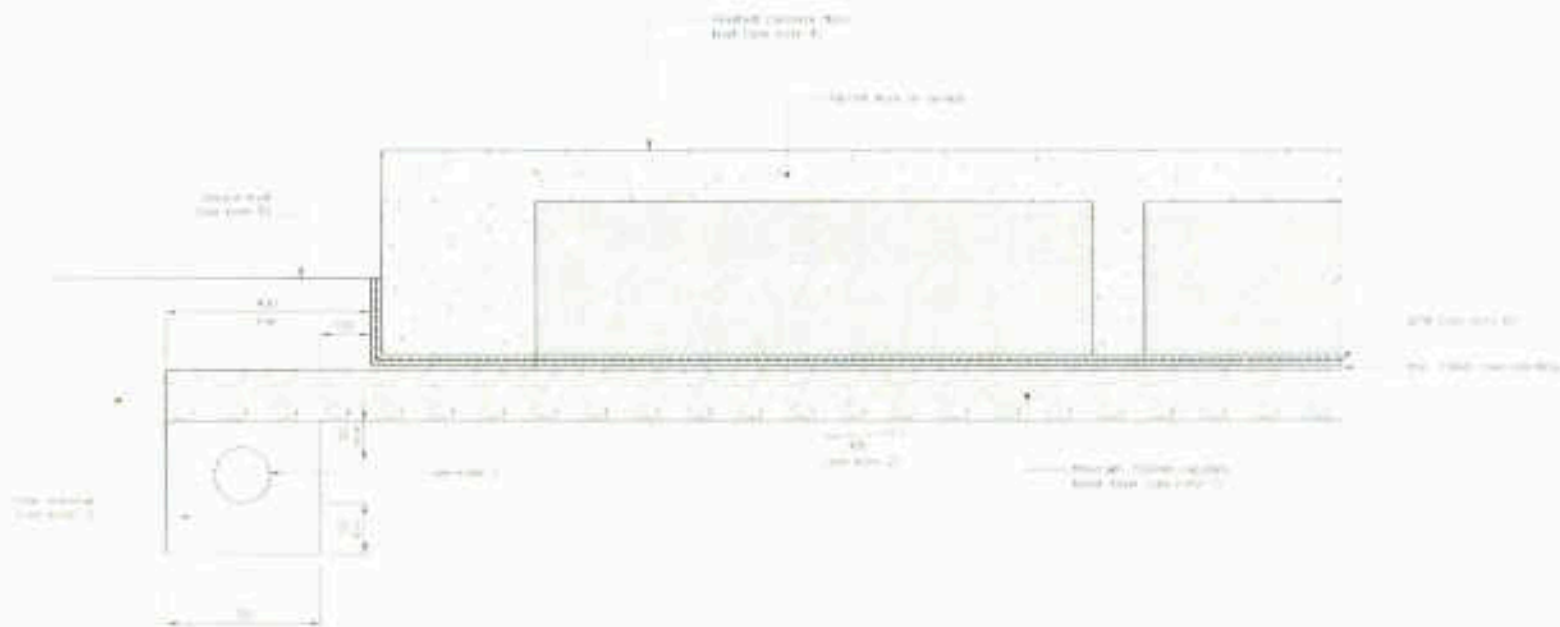


Michael O'Brien
MSC DIC MIPENZ (Geotechnical) CPEng, IntPE(NZ)
Geotechnical Engineer

O'Brien Geotech Ltd
43 B Brookfield Terrace,
Tauranga 3110
07 576 7575
029 777 9059
michael@obriengeotech.co.nz

Appendix A Figures + Proposed Details





- [illegible]



Year	1997-2000
Number of cases	100
Number of deaths	10
Number of cases by age group	
0-14	10
15-44	20
45-64	30
65+	40
Number of cases by sex	
Male	50
Female	50
Number of cases by race/ethnicity	
White	60
Black	20
Hispanic	10
Other	10

Appendix B Site Inspection Reports

O'BRIEN GEOTECH^{ltd}

Job: 16 Oakland Place, Ngongotaha

Job No: 583

Date: 8 May 2018

Observations and Instruction:

Subgrade inspected and probed. Considered to be acceptable, work can proceed.



Photograph Showing Cleared Site

For O'Brien Geotech Ltd,

Michael O'Brien

CPEng MSc, DIC, CMEngNz IntPE
Geotechnical Engineer

O'Brien Geotech Ltd

43 B Brookfield Terrace,

Tauranga 3110

07 576 7575

029 777 9059

michael@obriengeotech.co.nz

O'BRIEN GEOTECH LTD

Job: 16 Oakland Place, Ngongotaha

Job No: 583

Date: 17 July 2018

Observations and Instruction:

Fill fines tested using Scala Penetrometer. Approximately 400mm of fill present. Test locations and test results attached. Compaction acceptable. Work can proceed.



Photograph Showing Filled Site

For O'Brien Geotech Ltd,



Michael O'Brien

CPEng MSc. DIC. CMEngNz IntPE

Geotechnical Engineer

O'Brien Geotech Ltd

43 B Brookfield Terrace,

Tauranga 3110

07 576 7575

029 777 9059

michael@obriengeotech.co.nz

Sc1, Sc2, Sc3

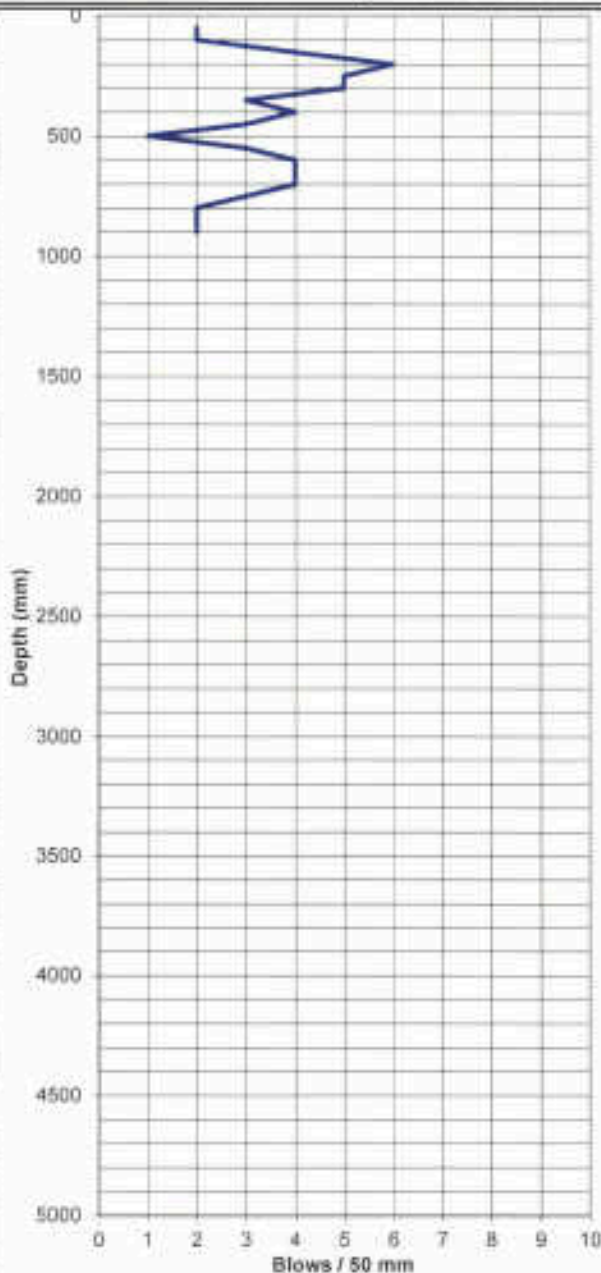
O'Brien Geotech Ltd
SCALA PENETROMETER LOG

Job No: 583
Project: 16 Oakland Drive, Ngongotaha
Location:
RL

Date: 17/07/2018
Operated by: MOB
Client: Mark Lam

Test No. SC 1
Sheet of 1

mm Driven	No. of Blows	mm Driven	No. of Blows
50	2	2550	
100	2	2600	
150	4	2650	
200	6	2700	
250	5	2750	
300	5	2800	
350	3	2850	
400	4	2900	
450	3	2950	
500	1	3000	
550	3	3050	
600	4	3100	
650	4	3150	
700	4	3200	
750	3	3250	
800	2	3300	
850	2	3350	
900	2	3400	
950		3450	
1000		3500	
1050		3550	
1100		3600	
1150		3650	
1200		3700	
1250		3750	
1300		3800	
1350		3850	
1400		3900	
1450		3950	
1500		4000	
1550		4050	
1600		4100	
1650		4150	
1700		4200	
1750		4250	
1800		4300	
1850		4350	
1900		4400	
1950		4450	
2000		4500	
2050		4550	
2100		4600	
2150		4650	
2200		4700	
2250		4750	
2300		4800	
2350		4850	
2400		4900	
2450		4950	
2500		5000	



Test Method Used: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer

Sc1, Sc2, Sc3

O'Brien Geotech Ltd

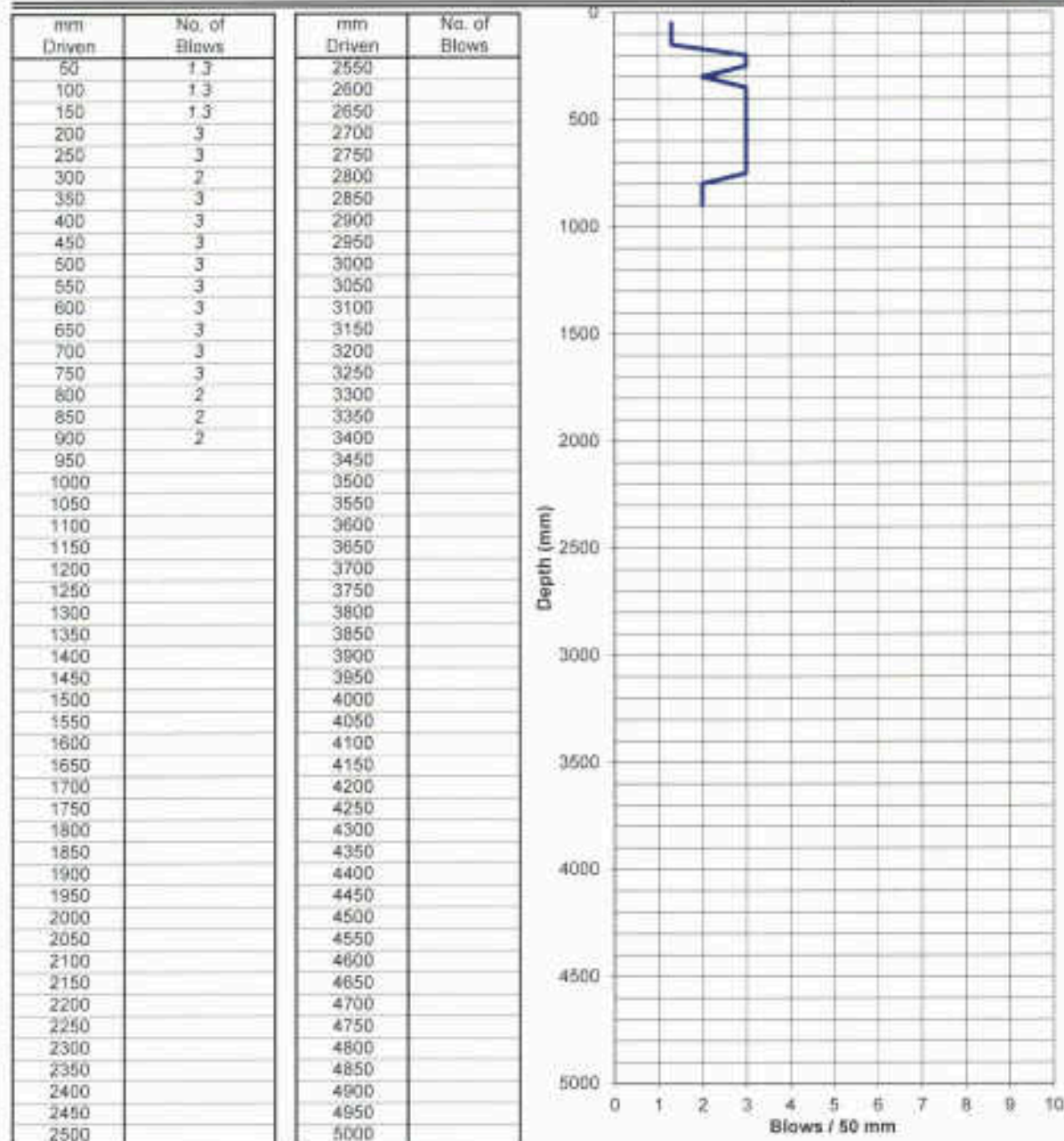
SCALA PENETROMETER LOG

Job No: 583
 Project: 16 Oakland Drive, Ngongotaha
 Location:
 RL:

Date: 17/07/2018
 Operated by: MOB
 Client: Mark Lam

Test No. SC 2

Sheet 1
 of 1



Test Method Used: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer

Sc1, Sc2, Sc3

O'Brien Geotech Ltd

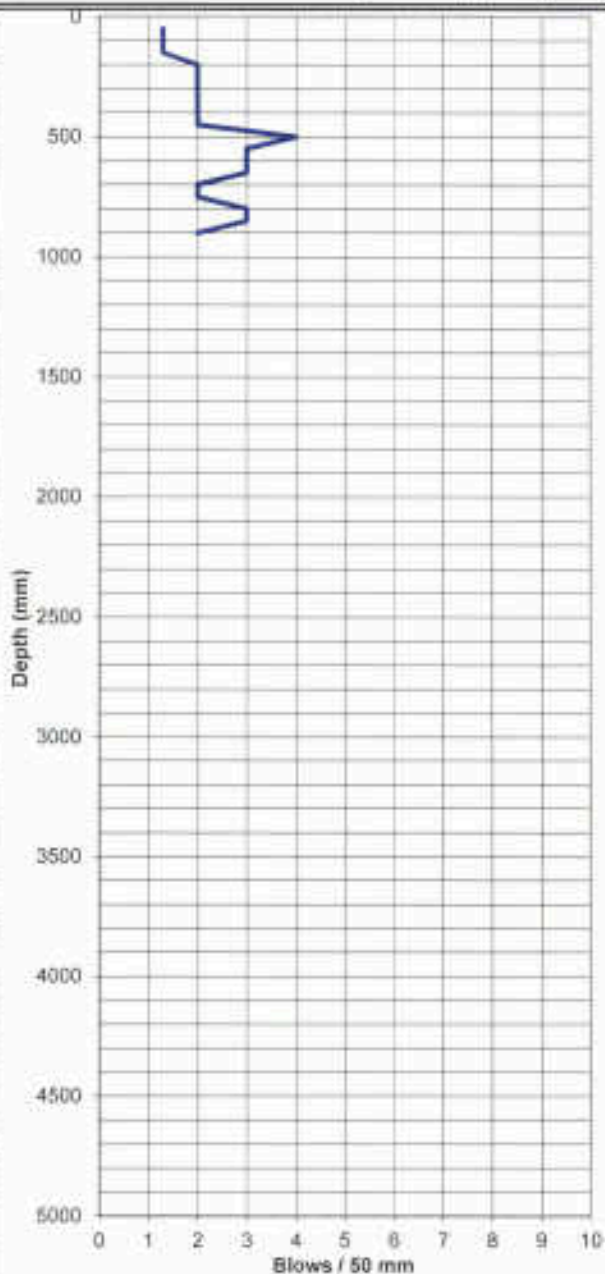
SCALA PENETROMETER LOG

Job No: 583
 Project: 16 Oakland Drive, Ngongotaha
 Location: see site location plan
 RL

Date: 17/07/2018
 Operated by: MOB
 Client: Mark Lam

Test No. SC
 Sheet of 1

mm Driven	No. of Blows	mm Driven	No. of Blows
50	1.3	2550	
100	1.3	2600	
150	1.3	2650	
200	2	2700	
250	2	2750	
300	2	2800	
350	2	2850	
400	2	2900	
450	2	2950	
500	4	3000	
550	3	3050	
600	3	3100	
650	3	3150	
700	2	3200	
750	2	3250	
800	3	3300	
850	3	3350	
900	2	3400	
950		3450	
1000		3500	
1050		3550	
1100		3600	
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1450		3950	
1500		4000	
1550		4050	
1600		4100	
1650		4150	
1700		4200	
1750		4250	
1800		4300	
1850		4350	
1900		4400	
1950		4450	
2000		4500	
2050		4550	
2100		4600	
2150		4650	
2200		4700	
2250		4750	
2300		4800	
2350		4850	
2400		4900	
2450		4950	
2500		5000	



Test Method Used: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer

(1)

Sc4

O'Brien Geotech Ltd

SCALA PENETROMETER LOG

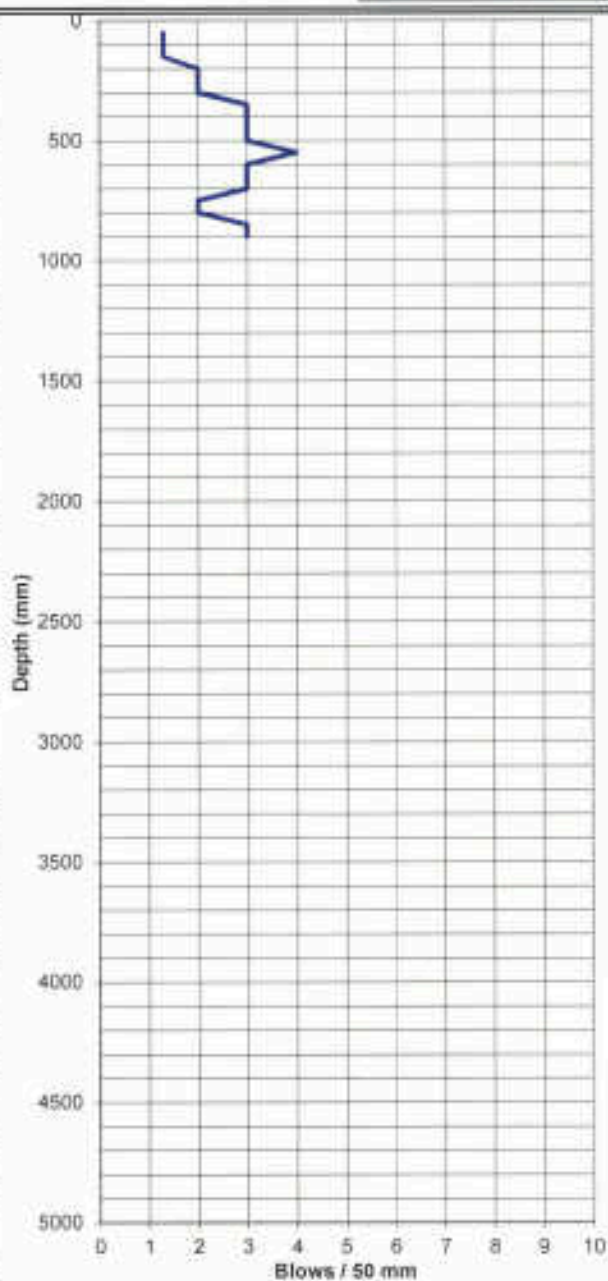
Job No: 583
 Project: 16 Oakland Drive, Ngongotaha
 Location:
 RL:

Date: 17/07/2018
 Operated by: MOB
 Client: Mark Lam

Test No. SC 4

Sheet 1
 of 1

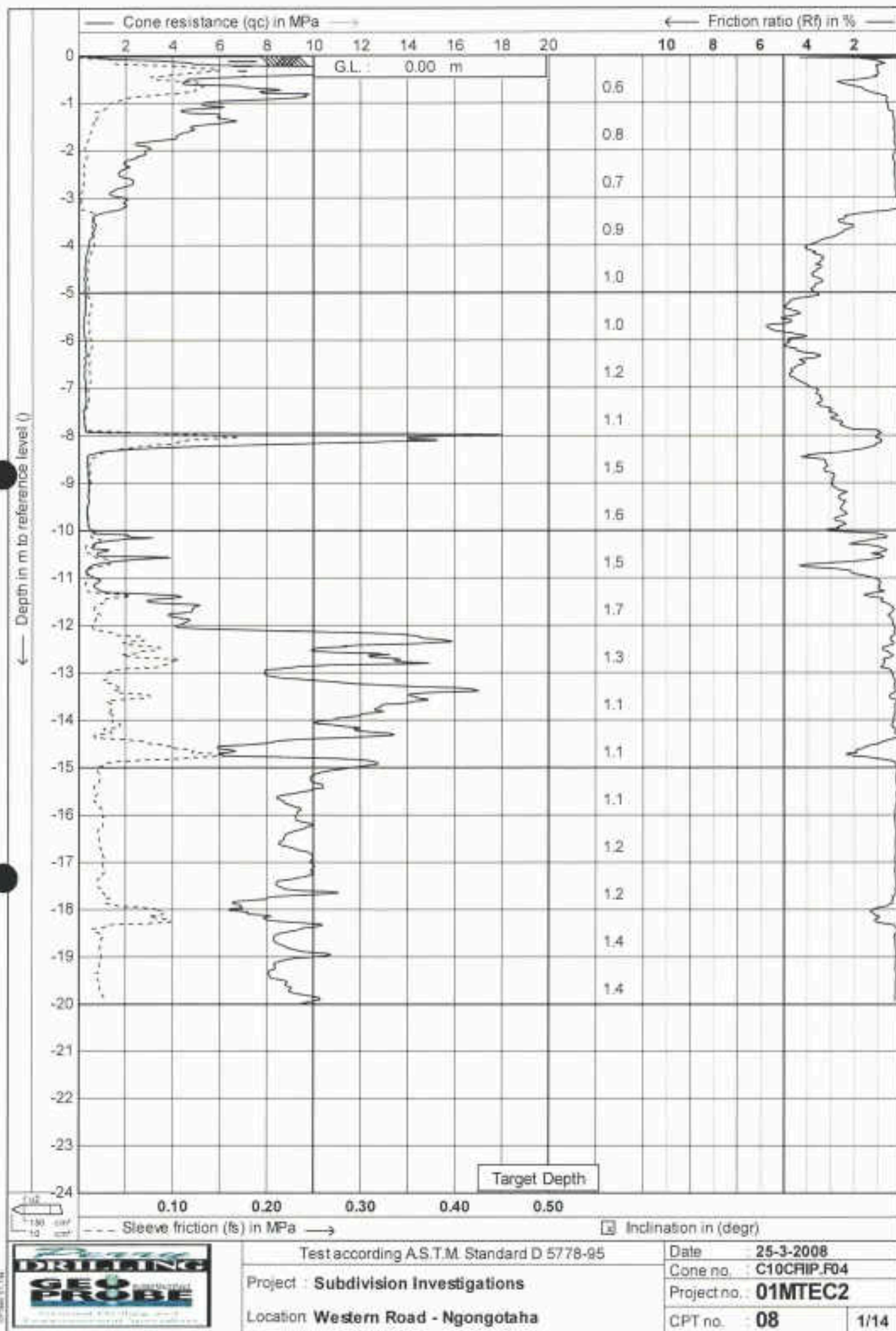
mm Driven	No. of Blows	mm Driven	No. of Blows
50	1.3	2550	
100	1.3	2600	
150	1.3	2650	
200	2	2700	
250	2	2750	
300	2	2800	
350	3	2850	
400	3	2900	
450	3	2950	
500	3	3000	
550	4	3050	
600	3	3100	
650	3	3150	
700	3	3200	
750	2	3250	
800	2	3300	
850	3	3350	
900	3	3400	
950		3450	
1000		3500	
1050		3550	
1100		3600	
1150		3650	
1200		3700	
1250		3750	
1300		3800	
1350		3850	
1400		3900	
1450		3950	
1500		4000	
1550		4050	
1600		4100	
1650		4150	
1700		4200	
1750		4250	
1800		4300	
1850		4350	
1900		4400	
1950		4450	
2000		4500	
2050		4550	
2100		4600	
2150		4650	
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2350		4850	
2400		4900	
2450		4950	
2500		5000	

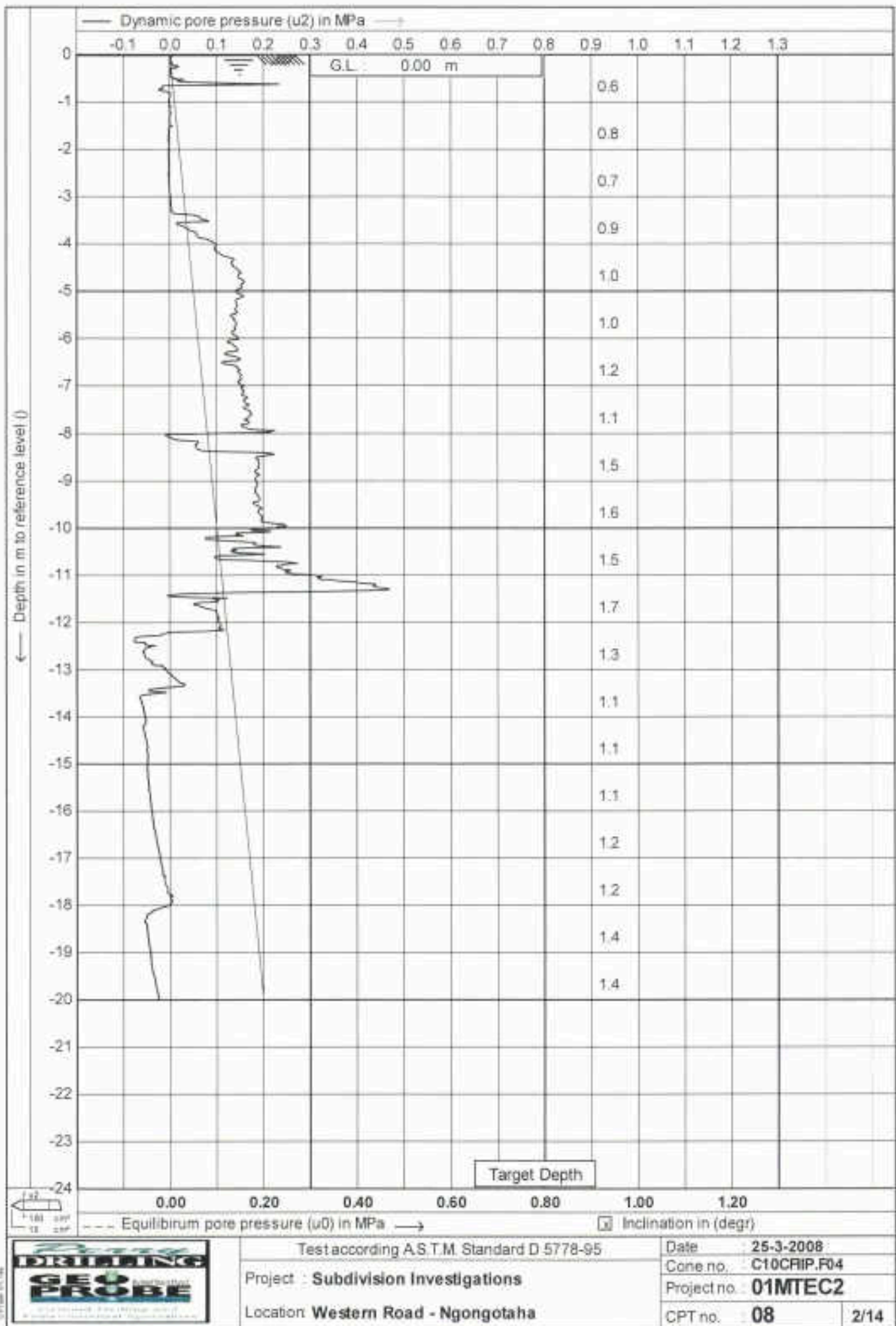


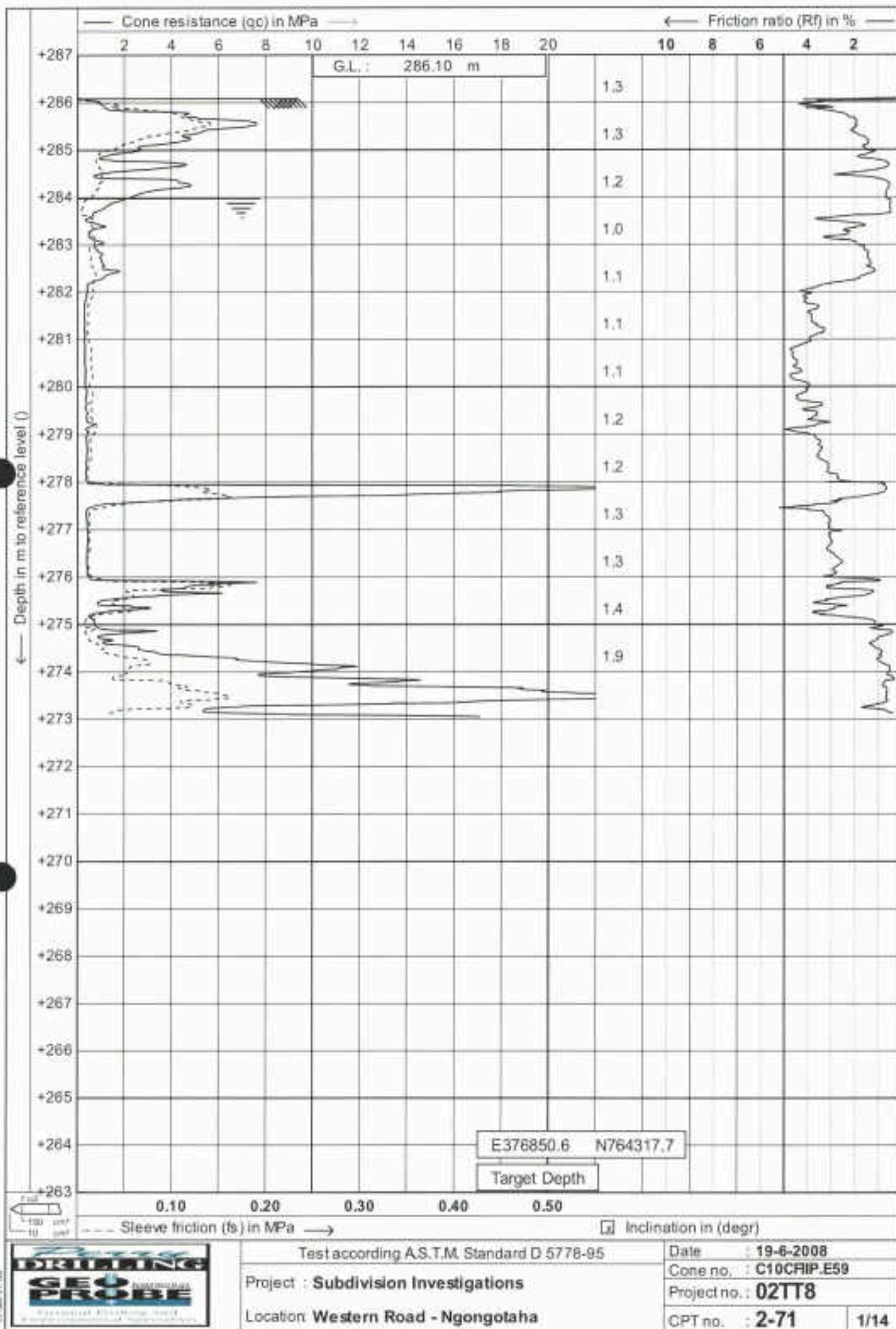
Test Method Used: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer

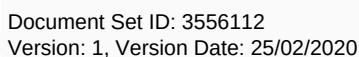
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Appendix C Site Investigation Data











Our Ref: 1003135.0.0.0/REP1
Customer Ref: 583
24 May 2017

O'Brien Geotech Ltd
43b Brookfield Rd
Otumoetai
Tauranga

Attention: Michael O'Brien

Dear Michael,

16 Oakland Place, Ngongotaha - Site Investigation Site Report

Introduction

Geotechnics was engaged to complete Hand Auger (HA) and Scala Penetrometer (SC) testing at the above mentioned location.

Date of Procedure

10 May 2017

Determining the Test Location

A location plan illustrating proposed investigation locations was provided to Geotechnics by Michael O'Brien of O'Brien Geotech Ltd. Investigation locations were positioned on site using a measuring tape and dimensions from the plan provided.

Location Plan

The attached plan provides indicative locations only and is not to scale.

Customer's Instructions

We were instructed to:

- Complete Hand Auger investigations at the locations and depths indicated on the provided plan.
- Carry out Shear Vane testing at 300mm centres in cohesive soil.
- Carry out Scala Penetrometer testing adjacent to hand auger boreholes.

Specifications

None Issued.

Methods

NZS 4402:1988 Test 6.5.2 - Determination of the penetration resistance of a soil (Hand method using a dynamic cone penetrometer) - Scala

NZGS 8:2001 - Test method for determining the vane shear strength of a cohesive soil using a hand held shear vane.

Material Description

Material descriptions are provided in the attached results.

Results

Results are attached.

Photos can be downloaded from the following link:

<https://transfer.tonkinandtaylorgroup.com/message/16NZt7hcNDkuJEpfFxoI8>.

This link will expire on 21 August 2017.

Test Remarks

Material Logging

Material logging and descriptions in the field are in general accordance with the New Zealand Geotechnical Society Inc in 'Guideline for the Field Classification of Soil and Rock for Engineering Purposes' (December 2005), excluding geological information and are based on the observational behaviour of the material.

The logs represent our best assessment of the sub-surface conditions, but due to the subjective nature of material logging, we take no responsibility for any inaccuracies or misinterpretations.

Scala

Our standard test procedure is to over-drill Scala penetrometer tests every 1m. As requested by you, we have not over-drilled these tests. This variation to the standard test method may increase friction with depth due to skin friction and the protrusion of the rod connectors. The results >1m deep may therefore not be accurate and are provided for your own interpretation and inference.

Shear Vane

Shear Vane tests are potentially unsuitable for material described in the borehole logs as 'non-plastic', 'sandy SILT' or 'silty SAND'. Tests in these materials may not be compliant with the stated test method. Results are provided for your own interpretation and inference.

General Remarks

We provide the results and logs for your interpretation and inference.

Please reproduce this report in full when transmitting to others or including in internal reports.

If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of the letterhead page.

GEOTECHNICS LTD

Report prepared by:



Spoffit Reid
Geotechnician

Authorised for Geotechnics by:

Paul Burton
I have reviewed this
document
2017.05.24 10:07:57 +1200

Paul Burton
Project Director

Report checked by:

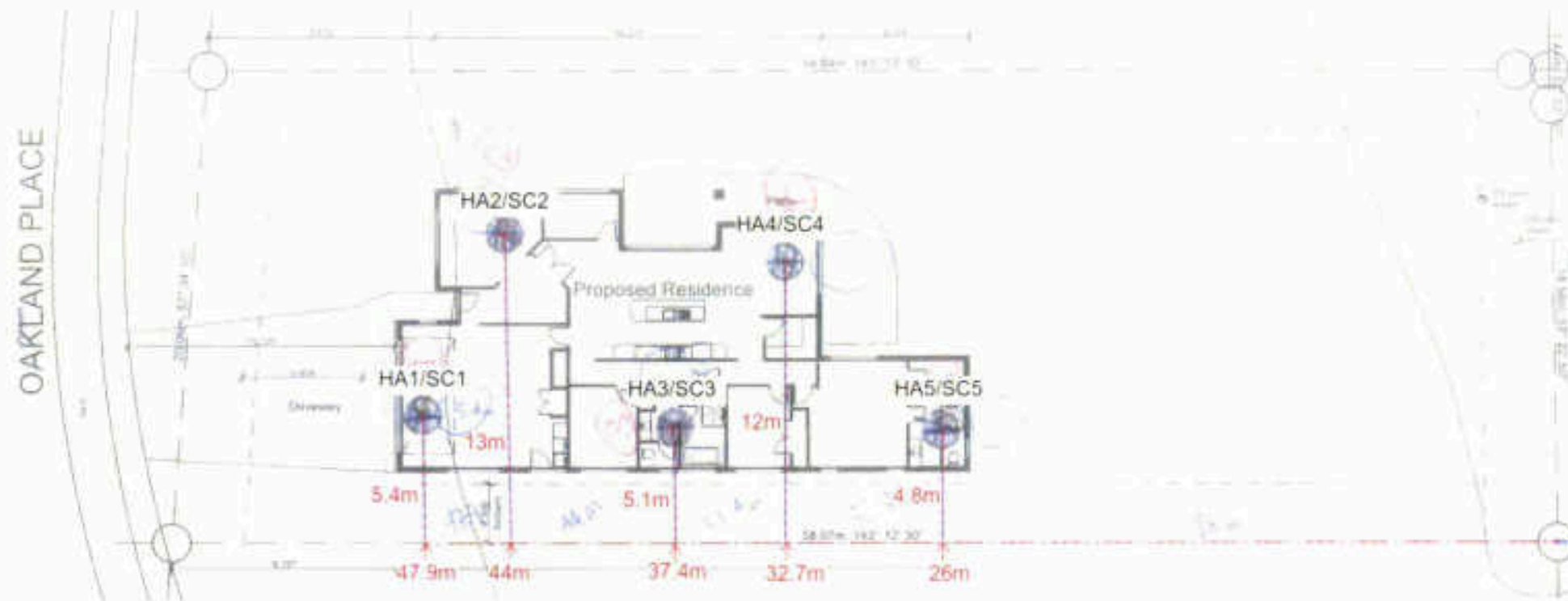


David Boston
Project Manager

This report consists of 14 pages.

24 May 17

t:\geotechnicsgroup\projects\1003135\workingmaterial\20170524 sre\16 oakland pi final report.docx



15C Amber Crescent
Judea
Tauranga 3110

LOCATION PLAN

16 Oakland Place, Ngongotaha - Site Investigation

Locations are indicative only

Site 16 Oakland Place
Location Ngongotaha
Project 1003135.0.0.0/REP1

Our Ref 1003135.0.0.0/REP1
Your Ref 583
Lab Ref N/A

Drawn SREI
Checked DFB
Scale

Date 24 May 2017
Date 24 May 2017
Not to Scale





BOREHOLE LOG

BOREHOLE No.:
HA01

SHEET: 1 OF 1

DRILLED BY: TADR

LOGGED BY: TADR

CHECKED: DFB

START DATE: 10/05/2017

FINISH DATE: 10/05/2017

CONTRACTOR: Geotechnics

PROJECT: 16 Oakland Place, Ngongotaha St
JOB No.: 1003135
LOCATION: Ngongotaha

CO-ORDINATES:

DIRECTION
ANGLE FROM HORIZ. -90°

R.L. GROUND:
R.L. COLLAR:
DATUM:
SURVEY: Map or aerial photograph

GEOLOGICAL UNIT	DESCRIPTION OF CORE	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS				Fluid Loss (%)	Water Level	Casing	Infiltration	Core Box No
										Defect Log	Fracture Spacing (mm)	ROD (m)	Description & Additional Observations					
	ROCK Classification index: consistency, density, moisture, plasticity ROCK Weathering index: texture, strength, permeability	100%	10-1400															
	SILT, with trace sand, trace gravel, blackish dark brown. Stiff, dry to moist, non-plastic, sand, fine to coarse, pumiceous, gravel, fine, subrounded, pumiceous. SILT, with minor sand, trace gravel, orange brown. Hard, dry to moist, non-plastic, sand, fine to coarse, pumiceous, gravel, fine, subangular to subrounded. Sandy SILT, light brownish grey. Hard, moist, non-plastic, sand, fine to medium. Fine to coarse SAND, with some silt, trace gravel, light brownish grey, minor grey mottling. Medium dense, moist, poorly graded, gravel, fine, pumiceous. 0.30m - light grey, trace light greyish brown mottling 1.70m - some orange brown mottling Fine to coarse SAND, with minor silt, light brownish grey with some grey mottling. Medium dense, moist to wet, poorly graded.																	
	End of borehole at 2.0mbgl. No groundwater encountered.																	

COMMENTS:

Scale Depth
2m

General Log - 10/05/2017 10:28:18 p.m. - Produced with Core-Log by Geotech



BOREHOLE LOG

BOREHOLE No.
HA03

SHEET: 1 OF 1

DRILLED BY: TASR

LOGGED BY: TASR

CHECKED: DFB

START DATE: 10/05/2017

FINISH DATE: 10/05/2017

CONTRACTOR: Geotechnics

PROJECT: 16 Oakland Place, Ngongotaha St
JOB No.: 1003135
LOCATION: Ngongotaha

CO-ORDINATES:

DIRECTION:

ANGLE FROM HORIZ. -90°

R.L. GROUND:

R.L. COLLAR:

DATUM:

SURVEY: Map or aerial photograph

GEOLOGICAL UNIT	DESCRIPTION OF CORE	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	H/L (m)	Depth (m)	Drifted Log	ROCK DEFECTS				Fluid Loss (%)	Water Level	Casing	Installation	Core Box (m)
										Defect Log	Fracture Spacing (mm)	RCD (%)	Description & Additional Observations					
	SOIL: Compact (solid consistency) silty medium plastic ROCK: Weathering (solid) hard, strong, cemented	BSR01	BS-04-02							BSR01	BS-04-02			BSR01				
	SILT, with trace sand, trace rootlets, blackish dark brown. Stiff, dry to moist, non-plastic; sand, fine to coarse, pumiceous.																	
	SILT, with minor sand, trace gravel, orange brown, trace white speckling. Hard, moist, non-plastic; sand, fine to coarse, pumiceous; gravel, fine, subrounded, pumiceous.					● 100% x16												
	Sandy SILT, light brownish grey. Hard, moist, non-plastic; sand, fine to medium.					● 100% x16												
	Silty, fine to coarse SAND; light brownish grey. Medium dense, moist, poorly graded.																	
	Sandy SILT, light brownish grey. Hard, moist, non-plastic; sand, fine to medium.																	
	Fine to coarse SAND; with minor silt, trace gravel, light greyish brown, with some grey mottling. Medium dense, moist, poorly graded; gravel, fine, subrounded, pumiceous.																	
	1.20m - gravel absent																	
	1.75m - wet																	
	End of borehole at 2.0mgl. No groundwater encountered.																	

COMMENTS:

Note Depth

2m

Scale 1:10

Rev. A



BOREHOLE LOG

BOREHOLE No.:
HA04

SHEET: 1 OF 1

DRILLED BY: TASR

LOGGED BY: TASR

CHECKED: DFB

START DATE: 10/05/2017

FINISH DATE: 10/05/2017

CONTRACTOR: Geotechnics

PROJECT: 16 Oakland Place, Ngongotaha St
JOB No.: 1003135
LOCATION: Ngongotaha

CO-ORDINATES

DIRECTION:

ANGLE FROM HORIZ: -90°

R.L. GROUND

R.L. COLLAR:

DATUM

SURVEY: Map or aerial photograph

GEOLOGICAL UNIT	DESCRIPTION OF CORE	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	Rc (MPa)	Depth (m)	Organic Log	Defect Log	Fracture Spacing (mm)	RQD (%)	ROCK DEFECTS Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No.
	SILT, clayey, olive-brown, silty, dense, plastic, clayey SILT, clayey, olive-brown, silty, dense, plastic, clayey																	
	SILT, with trace sand, trace gravel, blackish dark brown, stiff, moist, non-plastic, sand, fine to coarse, pumiceous; gravel, fine, subangular to subrounded, pumiceous																	
	SILT, with minor sand, minor gravel, orange brown, trace white speckling, hard, moist, non-plastic, sand, fine to coarse, pumiceous; gravel, fine, subrounded, pumiceous																	
	Sandy SILT, light brownish grey, hard, moist, non-plastic, sand, fine to medium																	
	Silty, fine to coarse SAND, with trace gravel, light greyish brown, dense, moist, poorly graded; gravel, fine, subrounded, pumiceous																	
	Sandy SILT, light brown, hard, moist, non-plastic, sand, fine to medium																	
	Fine to coarse, SAND, with minor silt, light brownish grey with some grey mottling, dense, moist, poorly graded																	
	1.32m - medium dense																	
	1.72m - wet																	
	End of borehole at 2.0mbgl No groundwater encountered																	

COMMENTS:

Moist Depth:

2m

Scale: 1:1



BOREHOLE LOG

BOREHOLE No.:
HA05

SHEET: 1 OF 1

DRILLED BY: TASR

LOGGED BY: TASR

CHECKED: DFB

START DATE: 10/05/2017

FINISH DATE: 10/05/2017

CONTRACTOR: Geotechnics

PROJECT: 16 Oakland Place, Ngongotaha St
JOB No.: 1003135
LOCATION: Ngongotaha

CO-ORDINATES:

DIRECTION:
ANGLE FROM HORIZ: -90°

R.L. GROUND:
R.L. COLLAR:
DATUM:
SURVEY: Map or aerial photograph

GEOLOGICAL UNIT	DESCRIPTION OF CORE	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	WL (%)	Depth (m)	Gravelly Log	ROCK DEFECTS				Fluid Loss (%)	Water Level	Casing	Integritation	Core Box No.
										Defect Log	Fracture (Spacing (mm))	RCD (%)	Description & Additional Observations					
	NOTE: Descriptions colour consistency (clarity, moisture, plasticity) NOTE: Weathering notes: fabric, pore strength, orientation	55889	55-642											5.00				
	SILT, with trace sand, blackish dark brown. Stiff, dry to moist, non-plastic, sand, fine to coarse, pumiceous.								TS									
	SILT, with minor sand, trace gravel, orange brown, trace white speckling. Hard, moist, non-plastic, sand, fine to coarse, pumiceous; gravel, fine, subrounded, pumiceous.					● U15			TS									
	Sandy SILT, light brownish grey. Hard, moist, non-plastic, sand, fine to medium.					● +27 w/s												
	Silty, fine to coarse SAND, with trace gravel; light brownish grey. Dense, moist, poorly graded, gravel, fine, subrounded, pumiceous.																	
	Fine to coarse SAND, with minor silt, trace gravel; light brown with some grey mottling. Medium dense, moist, poorly graded, gravel, fine, subrounded, pumiceous.																	
	1.50m - light brownish grey, trace light brown mottling																	
	Fine to coarse SAND, with minor silt, minor gravel; greyish orange brown. Medium dense, wet, well graded, gravel, fine, subangular to subrounded, pumiceous.																	
	End of borehole at 2.0mbgl. No groundwater encountered.																	

COMMENTS

Probe Depth: 2m

Scale: 1:10

Rev: A



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LAB. REF.:	063/17
FILE:	1003135.0.0.0/1

Sheet 1 of 1

Dynamic Cone Penetrometer (Scala) - NZS 4402:1996 Test 6.5.2					
Site: 16 Oakland Place		Job Name: 16 Oakland Pl, Ngongotaha SI		Job no: 583	
Test pit/BH no: SC1 / HA1		Location: Ngongotaha		Depth: 2.85m	
Material: See HA01 borehole log				Penetrometer ID: TGO851	
Test / Sample Series: 16OaklandPl/180517/SC1-5		New Test Site / Re-Test of Site - Lab-Ref:			
Vertical distance driven (mm)	Depth (mm)	No. of Blows	Vertical distance driven (mm)	Depth (mm)	No. of Blows
50	50	0.5	2050	2050	2
100	100	0.5	2100	2100	1
150	150	1	2150	2150	3
200	200	1	2200	2200	1
250	250	2	2250	2250	3
300	300	1	2300	2300	3
350	350	3	2350	2350	3
400	400	4	2400	2400	2
450	450	4	2450	2450	3
500	500	2	2500	2500	2
550	550	3	2550	2550	4
600	600	3	2600	2600	3
650	650	4	2650	2650	2
700	700	3	2700	2700	2
750	750	3	2750	2750	1
800	800	3	2800	2800	1
850	850	4	2850	2850	1
900	900	4	2900	2900	
950	950	2	2950	2950	
1000	1000	3	3000	3000	
1050	1050	2	3050	3050	
1100	1100	3	3100	3100	
1150	1150	3	3150	3150	
1200	1200	2	3200	3200	
1250	1250	3	3250	3250	
1300	1300	4	3300	3300	
1350	1350	2	3350	3350	
1400	1400	3	3400	3400	
1450	1450	4	3450	3450	
1500	1500	2	3500	3500	
1550	1550	2	3550	3550	
1600	1600	4	3600	3600	
1650	1650	5	3650	3650	
1700	1700	4	3700	3700	
1750	1750	3	3750	3750	
1800	1800	2	3800	3800	
1850	1850	2	3850	3850	
1900	1900	2	3900	3900	
1950	1950	1	3950	3950	
2000	2000	2	4000	4000	

Depth from ground surface to commencement of penetration: (m)

Tested:	TASR	Date:	10/05/2017
Calculated:	SREI	Date:	18/05/2017
Checked:		Date:	23/05/2017



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063/17
FILE:
1003135.0.0.0/1

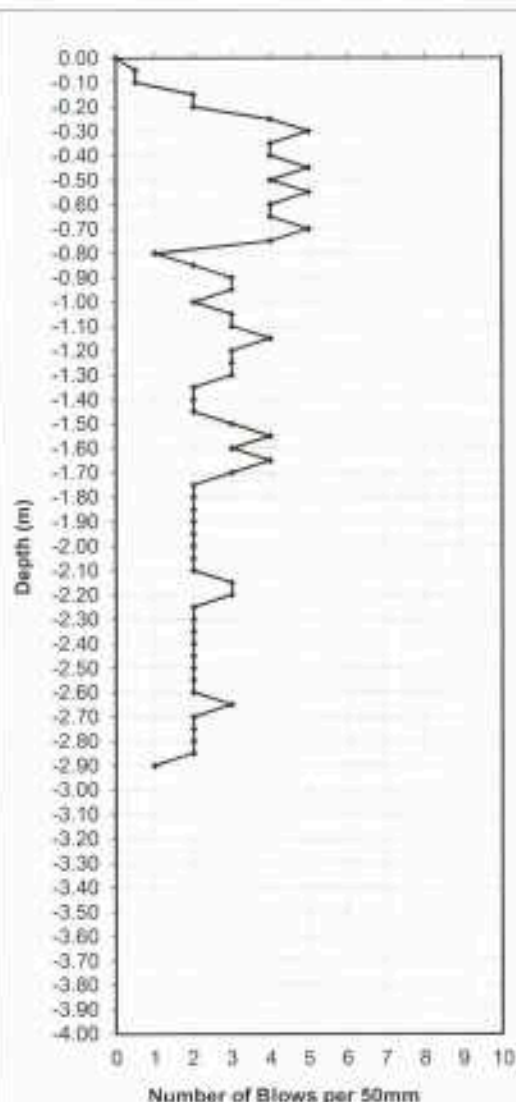
Sheet 1 of 1

Dynamic Cone Penetrometer (Scala) -NZS 4402:1986 Test 6.5.2

Site:	16 Oakland Place	Job Name:	16 Oakland Pl, Ngongotaha SI	Job no:	583
Test pit/BH no:	SC2 / HA2	Location:	Ngongotaha	Depth:	2.90m
Material:	See HA02 borehole log	Penetrometer ID:	TGO851		
Test / Sample Series:	16OaklandPl/180517/SC1-5	New Test Site / Re-Test of Site - Lab Ref.			

Vertical distance driven (mm)	Depth (mm)	No. of Blows	Vertical distance driven (mm)	Depth (mm)	No. of Blows
50	50	0.5	2050	2050	2
100	100	0.5	2100	2100	2
150	150	2	2150	2150	3
200	200	2	2200	2200	3
250	250	4	2250	2250	2
300	300	5	2300	2300	2
350	350	4	2350	2350	2
400	400	4	2400	2400	2
450	450	5	2450	2450	2
500	500	4	2500	2500	2
550	550	5	2550	2550	2
600	600	4	2600	2600	2
650	650	4	2650	2650	3
700	700	6	2700	2700	2
750	750	4	2750	2750	2
800	800	1	2800	2800	2
850	850	2	2850	2850	2
900	900	3	2900	2900	1
950	950	3	2950	2950	
1000	1000	2	3000	3000	
1050	1050	3	3050	3050	
1100	1100	3	3100	3100	
1150	1150	4	3150	3150	
1200	1200	3	3200	3200	
1250	1250	3	3250	3250	
1300	1300	3	3300	3300	
1350	1350	2	3350	3350	
1400	1400	2	3400	3400	
1450	1450	2	3450	3450	
1500	1500	3	3500	3500	
1550	1550	4	3550	3550	
1600	1600	3	3600	3600	
1650	1650	4	3650	3650	
1700	1700	3	3700	3700	
1750	1750	2	3750	3750	
1800	1800	2	3800	3800	
1850	1850	2	3850	3850	
1900	1900	2	3900	3900	
1950	1950	2	3950	3950	
2000	2000	2	4000	4000	

Depth from ground surface to commencement of penetration: (m)



Tested:	TASR	Date:	10/05/2017
Calculated:	SREI	Date:	18/05/2017
Checked:		Date:	23/05/2017



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LAB. REF.:	063/17
FILE:	1003135.0.0.0/1

Sheet 1 of 1

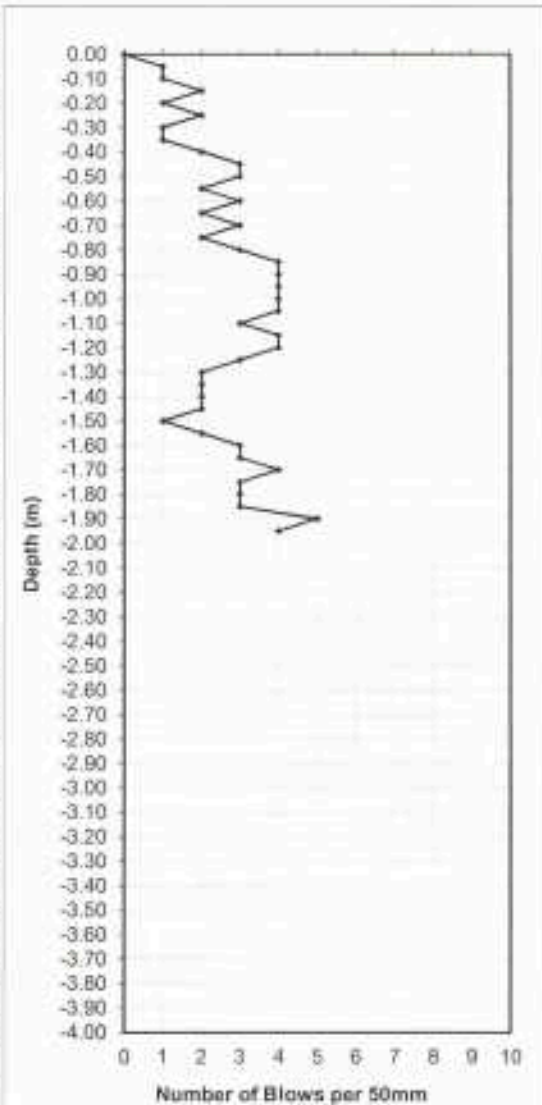
Dynamic Cone Penetrometer (Scala) -NZS 4402:1986 Test 6.5.2					
Site: 16 Oakland Place		Job Name: 16 Oakland Pl, Ngongotaha SI		Job no: 583	
Test pit/BH no: SC3 / HA3		Location: Ngongotaha		Depth: 2.90m	
Material: See HA03 borehole log		Penetrometer ID: TGO851			
Test / Sample Series: 16OaklandPl/180517/SC1-5		New Test Site / Re Test of Site - Lab Ref.			
Vertical distance driven (mm)	Depth (mm)	No. of Blows	Vertical distance driven (mm)	Depth (mm)	No. of Blows
50	50	0.5	2050	2050	2
100	100	0.5	2100	2100	3
150	150	2	2150	2150	3
200	200	2	2200	2200	2
250	250	4	2250	2250	2
300	300	5	2300	2300	2
350	350	3	2350	2350	2
400	400	3	2400	2400	2
450	450	5	2450	2450	1
500	500	3	2500	2500	2
550	550	4	2550	2550	2
600	600	3	2600	2600	1
650	650	2	2650	2650	2
700	700	2	2700	2700	1
750	750	3	2750	2750	2
800	800	1	2800	2800	1
850	850	1	2850	2850	1
900	900	2	2900	2900	1
950	950	3	2950	2950	
1000	1000	3	3000	3000	
1050	1050	2	3050	3050	
1100	1100	3	3100	3100	
1150	1150	2	3150	3150	
1200	1200	2	3200	3200	
1250	1250	2	3250	3250	
1300	1300	4	3300	3300	
1350	1350	2	3350	3350	
1400	1400	2	3400	3400	
1450	1450	2	3450	3450	
1500	1500	2	3500	3500	
1550	1550	2	3550	3550	
1600	1600	2	3600	3600	
1650	1650	2	3650	3650	
1700	1700	3	3700	3700	
1750	1750	2	3750	3750	
1800	1800	3	3800	3800	
1850	1850	2	3850	3850	
1900	1900	2	3900	3900	
1950	1950	2	3950	3950	
2000	2000	2	4000	4000	

Depth from ground surface to commencement of penetration: (m)

Tested:	TASR	Date:	10/05/2017
Calculated:	SREI	Date:	18/05/2017
Checked:		Date:	23/05/2017

Dynamic Cone Penetrometer (Scala) - NZS 4402:1986 Test 6.5.2					
Site: 16 Oakland Place		Job Name: 16 Oakland Pl, Ngongotaha SI		Job no: 583	
Test pit/BH no: SC4 / HA4		Location: Ngongotaha		Depth: 1.95m	
Material: See HA04 borehole log		Penetrometer ID: TGO851			
Test / Sample Series: 16OaklandPl/180517/SC1-5		New Test Site / Re-Test of Site - Lab-Ref:			
Vertical distance driven (mm)	Depth (mm)	No. of Blows	Vertical distance driven (mm)	Depth (mm)	No. of Blows
50	50	1	2050	2050	
100	100	1	2100	2100	
150	150	2	2150	2150	
200	200	1	2200	2200	
250	250	2	2250	2250	
300	300	1	2300	2300	
350	350	1	2350	2350	
400	400	2	2400	2400	
450	450	3	2450	2450	
500	500	3	2500	2500	
550	550	2	2550	2550	
600	600	3	2600	2600	
650	650	2	2650	2650	
700	700	3	2700	2700	
750	750	2	2750	2750	
800	800	3	2800	2800	
850	850	4	2850	2850	
900	900	4	2900	2900	
950	950	4	2950	2950	
1000	1000	4	3000	3000	
1050	1050	4	3050	3050	
1100	1100	3	3100	3100	
1150	1150	4	3150	3150	
1200	1200	4	3200	3200	
1250	1250	3	3250	3250	
1300	1300	2	3300	3300	
1350	1350	2	3350	3350	
1400	1400	2	3400	3400	
1450	1450	2	3450	3450	
1500	1500	1	3500	3500	
1550	1550	2	3550	3550	
1600	1600	3	3600	3600	
1650	1650	3	3650	3650	
1700	1700	4	3700	3700	
1750	1750	3	3750	3750	
1800	1800	3	3800	3800	
1850	1850	3	3850	3850	
1900	1900	5	3900	3900	
1950	1950	4	3950	3950	
2000	2000		4000	4000	

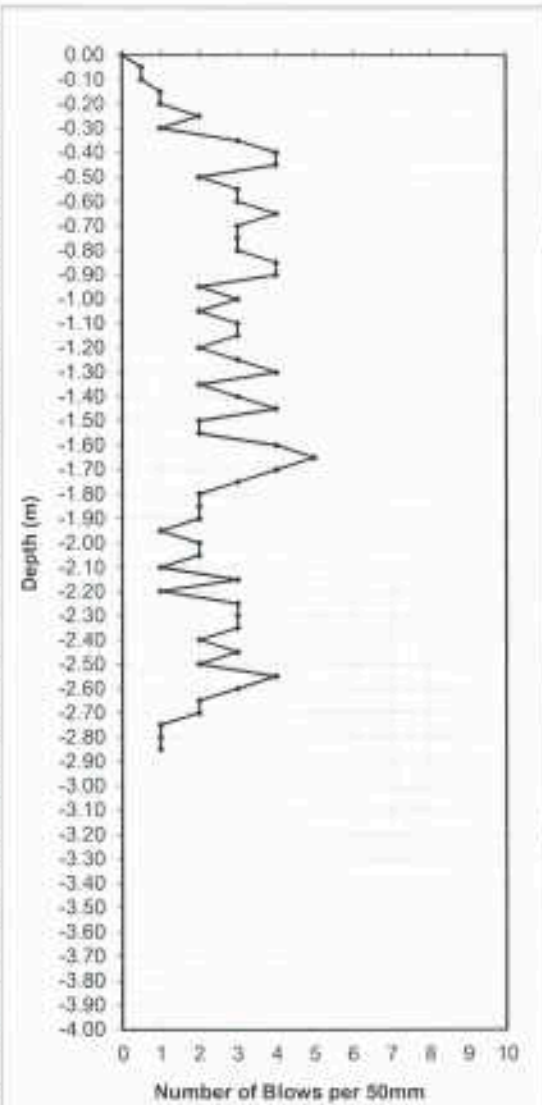
Depth from ground surface to commencement of penetration: 0 (m)



Tested:	TASR	Date:	10/05/2017
Calculated:	SREI	Date:	18/05/2017
Checked:		Date:	23/05/2017

Dynamic Cone Penetrometer (Scala) - NZS 4402:1996 Test 5.5.2					
Site: 16 Oakland Place		Job Name: 16 Oakland Pl, Ngongotaha SI		Job no: 583	
Test pit/BH no: SC5 / HA5		Location: Ngongotaha		Depth: 2.85m	
Material: See HA05 borehole log		Penetrometer ID: TGO851			
Test / Sample Series: 16OaklandPl/180517/SC1-5		New Test Site / Re-Test of Site - Lab Ref:			
Vertical distance driven (mm)	Depth (mm)	No. of Blows	Vertical distance driven (mm)	Depth (mm)	No. of Blows
50	50	0.5	2050	2050	2
100	100	0.5	2100	2100	1
150	150	1	2150	2150	3
200	200	1	2200	2200	1
250	250	2	2250	2250	3
300	300	1	2300	2300	3
350	350	3	2350	2350	3
400	400	4	2400	2400	2
450	450	4	2450	2450	3
500	500	2	2500	2500	2
550	550	3	2550	2550	4
600	600	3	2600	2600	3
650	650	4	2650	2650	2
700	700	3	2700	2700	2
750	750	3	2750	2750	1
800	800	3	2800	2800	1
850	850	4	2850	2850	1
900	900	4	2900	2900	
950	950	2	2950	2950	
1000	1000	3	3000	3000	
1050	1050	2	3050	3050	
1100	1100	3	3100	3100	
1150	1150	3	3150	3150	
1200	1200	2	3200	3200	
1250	1250	3	3250	3250	
1300	1300	4	3300	3300	
1350	1350	2	3350	3350	
1400	1400	3	3400	3400	
1450	1450	4	3450	3450	
1500	1500	2	3500	3500	
1550	1550	2	3550	3550	
1600	1600	4	3600	3600	
1650	1650	5	3650	3650	
1700	1700	4	3700	3700	
1750	1750	3	3750	3750	
1800	1800	2	3800	3800	
1850	1850	2	3850	3850	
1900	1900	2	3900	3900	
1950	1950	1	3950	3950	
2000	2000	2	4000	4000	

Depth from ground surface to commencement of penetration: 0 (m)



Tested:	TASR	Date:	10/05/2017
Calculated:	SREI	Date:	18/05/2017
Checked:		Date:	23/05/2017