Soil&Rock Consultants
GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

GEOTECHNICAL INVESTIGATION

PROPOSED RURAL RESIDENTIAL SUBDIVISION
631 SHANDS ROAD, PREBBLETON

PREPARED FOR MR M.J STRATFORD

JOB NO : C15449
DATE: 16 OCTOBER 2015

Document Control Record

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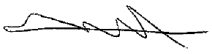
Document Control			
Document Title	Geotechnical Investigation		
Project	Proposed Rural Residential Subdivision	**Project Number**	C15449
Client	Mr M.J Stratford		
Prepared By		Nicholas Ferigo Geologist	
Reviewed By		Ferry Haryono Senior Geotechnical Engineer CPEng Author No. 1024076	
Authorised		Robert Smith Senior Geotechnical Engineer	

Revision History								
Rev	**Date**	**Amendment**	**Prepared By**		**Reviewed By**		**Authorised**	
Draft	9/10/15	Draft for Review	NF		PS			
A	16/10/15	Issue to Client	NF		FH		RS	

DISTRIBUTION:

M.J STRATFORD C/- Graham Fowler	Graham.Fowler@calibreconsulting.co.nz	PDF

Table Of Contents

Appendices

1.0 Introduction

1.1 Project Brief

Soil & Rock Consultants have been engaged by Michael J Stratford to undertake a geotechnical site investigation for a proposed plan change for subdivision at 631 Shands Road, Prebbleton. The site is currently classified as Rural Residential (Living 3) and the proposal is for the entire site to be subdivided into about 26 large allotments.

This report contains information based on a previous Soil & Rock Consultants report and testing undertaken for M.J Stratford titled "Proposed Rural Subdivision, 631 Shands Road, Prebbleton" C12113, Dated 3rd August 2012. The scope of our previous report, which was only for a small portion of the current assessed site, was to determine subsurface conditions and provide comment as to the suitability of the land to subdivide addressing the requirements of Section 106 of the Resource Management Act 1991. The current proposed Plan Change requires further deep testing to satisfy the current Ministry of Business Innovation and Employment (MBIE) guidelines as well as to get better investigative cover across the wider site.

This report summarises our findings and recommendations and may be used to support a Plan Change Consent application to Selwyn District Council.

Recommendations have also been provided for foundations for proposed new dwellings.

2.0 Site Description

The subject site, located at 631 Shands Road, Prebbleton is legally described as Lot 1, DP53113 covering a total area of about16 hectares. The site comprises near level grassed land and is occupied by a large residential dwelling, stable area and farm sheds.

There is a number of large poplar trees along the Shands Road boundary and a number of other mature shelter belt plantings along paddock fence lines within the property.

3.0 Proposed Development

Soil & Rock Consultants are in receipt of a drawing titled "Proposed Subdivision 631 Shands Road" dated June 2014 and drawn by Calibre Consulting. The drawing indicates subdivision of the land into 26 Lots, with an average allotment area of between 0.45 and 1.29 hectares.

Figure 1: Site Location and Layout (Image taken from Calibre Consulting Proposed Subdivision of Lot 1 DP 53113)

4.0 Geology and Geomorphology

Reference to the New Zealand Geological and Nuclear Sciences Geologic Map 16, Christchurch, scale 1: 250,000 and dated 2008, indicates the site is underlain by Q1a river and alluvial fan deposits consisting of gravels, sands and silts of the late Pleistocene Age.

A search of the Environment Canterbury (ECAN) GIS website returned two water bore well logs relevant to the site. The logs indicate the general area is underlain by various assortments of sandy river gravels, occasional interbedded layers of clay, consistent with the geology described on the abovementioned map. Copies of the logs obtained from ECAN are attached as Appendix – D.

5.0 Field Investigation

5.1 Dynamic Probe Testing

Soil behaviour types and relative densities inferred from the DPSH data. SPT 'N' Values have been correlated from the DPSH testing for the gravel deposits inferred from the high blow counts. The correlation between DPSH blow counts (Nd) and equivalent SPT 'N' (N300) over a distance (d) is as follows:

$$N300 = \frac{300}{d} Nd$$

Four Dynamic Probe Super Hard (DPSH) tests were undertaken over the site at depths from surface to between 1.10m and 7.20 m bpgl – Appendix C

The testing was carried out by a specialist tracked CPT/DPSH rig operated by Ground Investigation Ltd in accordance with ASTM Standards D5778-12 'Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils'.

Dynamic Probe Super Heavy (DPSH) testing was undertaken from surface at all four test locations and all met practical refusal due to high cone tip resistance at depths of 1.10m to 7.20m bpgl. This correlates with the test pit investigation information in Section 6.1 in which tightly packed Sandy GRAVEL was encountered with the corresponding DPSH relative density of SPT N60 of dense to very dense.

The testing was carried out in accordance with BS 1377: Part 9:1990 and is conducted using the standard hammer weight, drop height and rod diameter of the SPT test and, as such, is similar to a continuous SPT test.

The tests were positioned to provide the most effective coverage of the site considering the proposed development footprint. Test locations were recorded by handheld GPS and reduced levels interpolated from the LiDAR and are therefore approximate only. All test locations are presented on the Test Location Plan in – Appendix A.

5.2 Previous Testing at 631 Shands Road

- Previous field testing at this site comprised of:Excavation of twelve Test Pits to 2.0m deep in July 2012 – Appendix B
- Scala Penetrometer testing from the ground surface adjacent to each test pit excavation.

6.0 Subsurface Conditions

The subsurface conditions described below are based on those encountered within the previous test pit excavations and inferred at the DPSH test sites.

6.1 Summary of the subsurface conditions:

Subsurface conditions encountered at the test locations are summarised in Table 1 and a detailed description of the soils encountered during excavation is given on the attached – Appendix B

Table 1: Simplified Soil Profile.

Soil Type	Depth to Bottom of layer (End of Testing) (m)	Layer Thickness (m)	Relative Density / Consistency
TOPSOIL (SILT/SAND)	0.2-0.3	0.2-0.3	N/A
Sandy SILT	0.6-1.2	0.3-0.9	Firm to Stiff
Sandy GRAVEL	7.2	6.0-6.6	Dense to Very Dense

Although groundwater (GW) was not encountered in any Soil & Rock Consultants testing, Ecan wellbores M36/3989 & M36/5119 – Appendix D suggests a groundwater level of between 8.50m and 10.10m bpgl respectively. A GW level of 3.0m bpgl was used in liquefaction analyses to confirm the suitability of the ground.

6.2 Liquefaction Analysis

SPT based liquefaction analyses from the DPSH data was undertaken using the LiqIT software (4.7.7.5) and the Boulanger & Idriss (2004) methodology. A conservative fines content of 5% and a unit weight of 20kN/m^3 has been applied for the sandy gravel deposits encountered. A groundwater level of 8m was also considered.

As the groundwater level for the site is assessed to be at 8m depth, our liquefaction analyses from the DPSH (SPT) data indicates that there are no liquefiable soil layers in all three design levels of shaking (SLS, SLS2 and ULS). The site can be considered to have at least an 8m non liquefiable crust.

6.3 Expected Future Land Performance/Technical Category

The MBIE Guidelines provide broad classification of land for future land performance based on index values of expected ground settlements for residential sites. The calculation of index values within the upper 10m of the soil profile, as specified in the MBIE Guidelines, and the expected future land performance technical category, based on average values across the site, is shown in Table 2.

Table 2: Expected Future Land performance Categories

Technical Category	Expected SLS Land Settlement (mm)		Expected ULS Land Settlement (mm)	
TC1	0 - 15	✓	0 - 25	✓
TC2	15 – 50		25 - 100	
TC3	>50		>100	

Liquefaction analyses indicates that liquefaction-induced ground subsidence is within the designated confines of TC1 land performance, it does not change the current designation of TC1 for the property.

6.4 Geotechnical Ultimate Bearing Capacity

With reference to our investigation results and analysis we consider that a geotechnical Ultimate Bearing Capacity 200kPa is available from 0.3m below current ground level. 300kPa is available below 0.4m below current ground level for the design of shallow foundations.

A strength reduction factor of Φ = 0.5 should be applied to the Ultimate Bearing Capacity to determine the Dependable Bearing Capacity (i.e. Φqu), which should be equal to or exceed the factored Ultimate Limit State design loads.

7.0 RMA Section 106 Assessment

Section 106 of the Resource Management Act 1991 states that a consent authority may refuse to grant subdivision consent if the land is likely to be subject to

- Erosion, including surface and subsurface erosion, associated with water and wind.
- Falling debris, including rockfalls that could impact the site from upslope sources.
- Subsidence, which involves the removal of underlying support by natural or artificial means.
- Slippage, which is defined as the downslope transfer of materials by sliding and/or flowage.
- Inundation, which may be sourced from streams, coastal processes or excess precipitation.

We consider it unlikely that the site will be subject to erosion due to the site not being located within close proximity to any significant watercourses and the level nature of the area. It is also unlikely that the site will be subject to adverse wind erosion due to the surface soils that tend to cohere and resist wind uplift. However careful agricultural practices should be followed to ensure wind erosion does not occur.

Falling debris from upslope land slippage or rock fall is not possible at this site in the absence of any elevated land in proximity to the site.

Due to the presence of the well packed gravels (Q1a) underlying the site from 0.5m at the site, we consider that there is minimal risk of liquefaction induced ground damage from occurring. Minor consolidation settlement of the ground could be expected for buildings founded directly on the sandy silt soils in comparison.

Due to the near level nature of the site, slope instability will not adversely affect the property. Because the site soils are non-liquefiable there exists no chance of lateral spreading occurring during a seismic event.

Inundation from water ejected from the ground under pressure as a consequence of liquefaction cannot occur at this site due to the soils being non-liquefiable. We have not carried out a flood assessment for the property as this was beyond the scope of our brief.

In conclusion we consider the site is suitable for subdivision from a geotechnical perspective.

7.1 Site Seismicity

For the purpose of applying requirements of NZS 1170.5:2004 the site subsoil is Class D – Deep or Soft Soil Site. This classification reflects the considerable depth to "basement" rock beneath the Prebbleton area.

8.0 Development Recommendations

8.1 Foundation Options

With reference to the Section 6.4 a geotechnical Ultimate Bearing Capacity of 200kPa and 300kPa can be assumed below 0.30m and 0.40m bgpl respectively.

Although we are not in receipt of any structural plans or drawings for proposed dwellings, the MBIE guidance suggests that the following foundation options, are considered appropriate for the proposed residential development:

8.1.1 Timber floor

Shallow pile foundation in accordance with NZS 3604, the piles need to be founded at 0.4m bpgl.

8.1.2 Concrete floor

Option 1 to 4 concrete slab;

Option One – Enhanced concrete slab with approved compacted granular fill of 300mm minimum depth.

Option Two – 300mm to 400mm thick slab foundation.

Option Three – Beam grid and slab foundation.

Option Four – An enhanced waffle slab over the existing soils.

Slab-on-grade floors may be constructed in accordance with the requirements of NZS 3604:2011, provided all existing topsoil is removed from beneath the floor slab areas, and local variations promulgated by MBIE after the Christchurch Earthquake series are incorporated. All slab-on-grade floors should be underlain by a layer of no less than 150mm of granular fill with the grading recommended by NZS 3604:2011.

The variability in the depth of the weathered silts and gravel alluvium mean further lot specific investigation is suggested at the time of individual building development.

9.0 Construction Considerations

9.1 Pavements

Vegetation, any organic or deleterious material, topsoil, and non-engineered fill should be removed from the site under pavement areas prior to aggregate placement. Based on our observations during testing, we consider the natural ground at the site should provide an adequate subgrade for the proposed pavement areas. We recommend for preliminary design a CBR value of 3% or a

modulus of subgrade reaction of 30 kPa/mm, for flexible or rigid pavements respectively. The design values should be confirmed by testing once pavement subgrade construction has been completed.

The thickness of basecourse for a flexible pavement would depend on the final CBR value used for the subgrade and the traffic loads anticipated. The compaction of the basecourse should be carried out with a roller of appropriate static weight.

9.2 Stormwater Control

Concentrated stormwater flows from all impermeable areas must be collected and carried in sealed pipes to the Council system.

Uncontrolled stormwater flows must not be allowed to run onto or saturate the ground so as to adversely affect foundation performance both statically and during future seismic activity.

9.3 Underground Services

Flexible connections should be constructed where all service drains and ducts either enter/exit concrete floor slabs. Service trench backfill should comprise well graded crushed stone aggregate (i.e. CAP 20).

10.0 Further Geotechnical Involvement

Our test locations across at 631 Shands Road, Prebbleton have been carried out to determine the suitability of of the site for Plan Change consent. Therefore the foundation recommendations presented herein are indicative only and Lot specific geotechnical investigations will be required for the design of suitable foundations for the any proposed structures.

11.0 Limitations

This report has been prepared for the sole benefit of our Client, Michael J Stratford, with respect to the particular brief given to us. The reliance by other parties on the information or opinions contained within this report shall, without our prior review and agreement in writing, be at such parties' sole risk.

The recommendations given in this report are based on site data from discrete locations. Inferences about the subsoil conditions away from the test location have been made, but cannot be guaranteed. We have inferred a geotechnical model that can be applied for our analyses, however, variations in ground conditions from those described in this report could exist across the site. Should conditions differ to those outlined in this report we ask that we be given the opportunity to review the continued applicability of our recommendations.

The investigation has been confined to geotechnical aspects of the site and did not involve assessment or testing for environmental contaminants. Our investigation and assessments have also not taken into account possible fault rupture that may cause deformations and displacements of the ground directly below the site. This is outside of the scope of our engagement and beyond the realms of geotechnical investigation and assessment, and from recent accounts nearly impossible to predict.

12.0 References

1. AS/NZS 1170.0:2002, 2002. Structural Design Actions Part 0: General Principles.

2. Boulanger, R. W., and Idriss, I. M., 2004. State normalization of penetration resistances and the effect of overburden stress on liquefaction resistance. Proc., 11th Intl. Conf. on Soil Dynamics and Earthquake Engineering, and 3rd Intl. Conf. on Earthquake Geotechnical Engineering, Doolin et al., eds, Stallion Press, Vol. 2, pp. 484-491.

3. NZGS, 2005. Field Description of Soil and Rock. Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes, NZ Geotechnical Society Inc, Wellington, New Zealand.

4. Boulanger, R.W., and Idriss, I.M., 2010. SPT-Based Liquefaction Triggering Procedures, Report No. UCD/CGM-10-02. University of California, Davis, California.

5. Ministry of Business, Innovation and Employment, 2014b. *Clarifications and updates to the Guidance 'Repairing and Rebuilding Houses Affected by The Canterbury Earthquakes',* Issue 7, October 2014.

6. GNS Science 2008. Geology of the Christchurch 1:250,000 geological Map 16. New Zealand.

7. Canterbury Earthquake Recovery Authority (CERA), 2015. Canterbury Geotechnical Database (CGD), Available at https://canterburygeotechnicaldatabase.projectorbit.com [accessed 05/10/2015]

8. BS 1377: Part 9:1990. Methods for test for soils for civil engineering purposes, In-situ tests.

13.0 Statement of Professional Opinion

Issued By: Soil & Rock Consultants

To: M. J Stratford

To Be Supplied To: Selwyn District Council

In Respect Of: Proposed Rural Residential Subdivision

At: 631 Shands Road, Prebbleton

I, **FERRY HARYONO** of **SOIL & ROCK CONSULTANTS**

Hereby confirm that:

1. I am a Chartered Professional Engineer experienced in the field of geotechnical engineering. Soil & Rock Consultants were engaged by Mr M. J Stratford to carry out a geotechnical investigation at the proposed development site.

2. The extent and findings of our investigation are presented within the report, titled *"Geotechnical Investigation Report, Proposed Rural Residential Subdivision, 631, Shands Road, Prebbleton"* referenced C15449, dated 9 October 2015.

3. In my professional opinion, not to be construed as a guarantee, I consider that:

   (a) The site of the proposed new subdivision as shown on the attached plan, titled *"Test Location Plan, 631 Shands Road, Prebbleton",* ref C15449/1 and drawn September 2015, is considered Technical Land Category 1 (TC1) as based on our quantitative assessment in accordance with the Ministry of Business, Innovation and Housing document titled "*Repairing and rebuilding houses affected by the Canterbury earthquakes"*, dated December 2012.

   (b) In accordance with the MBIE Guidance Document*, "Repairing and rebuilding houses affected by the Canterbury earthquakes"*, dated December 2012, we recommend foundations for future residential development should comprise foundations embedded to depths between 0.2m and 0.4m below current ground level.

   (c) We recommend for preliminary design a CBR value of 3% or a modulus of subgrade reaction of 30 kPa/mm, for flexible or rigid pavements respectively. The design values should be confirmed by testing once pavement subgrade construction has been completed.

4. This professional opinion is furnished to the territorial authority and the owner for their purposes alone on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation excavations at the time of construction.

5. This professional opinion shall be read in conjunction with the geotechnical investigation report referred to in clause 2 above and shall not be copied or reproduced except in conjunction with the full geotechnical investigation report.

Signed: 

Ferry Haryono

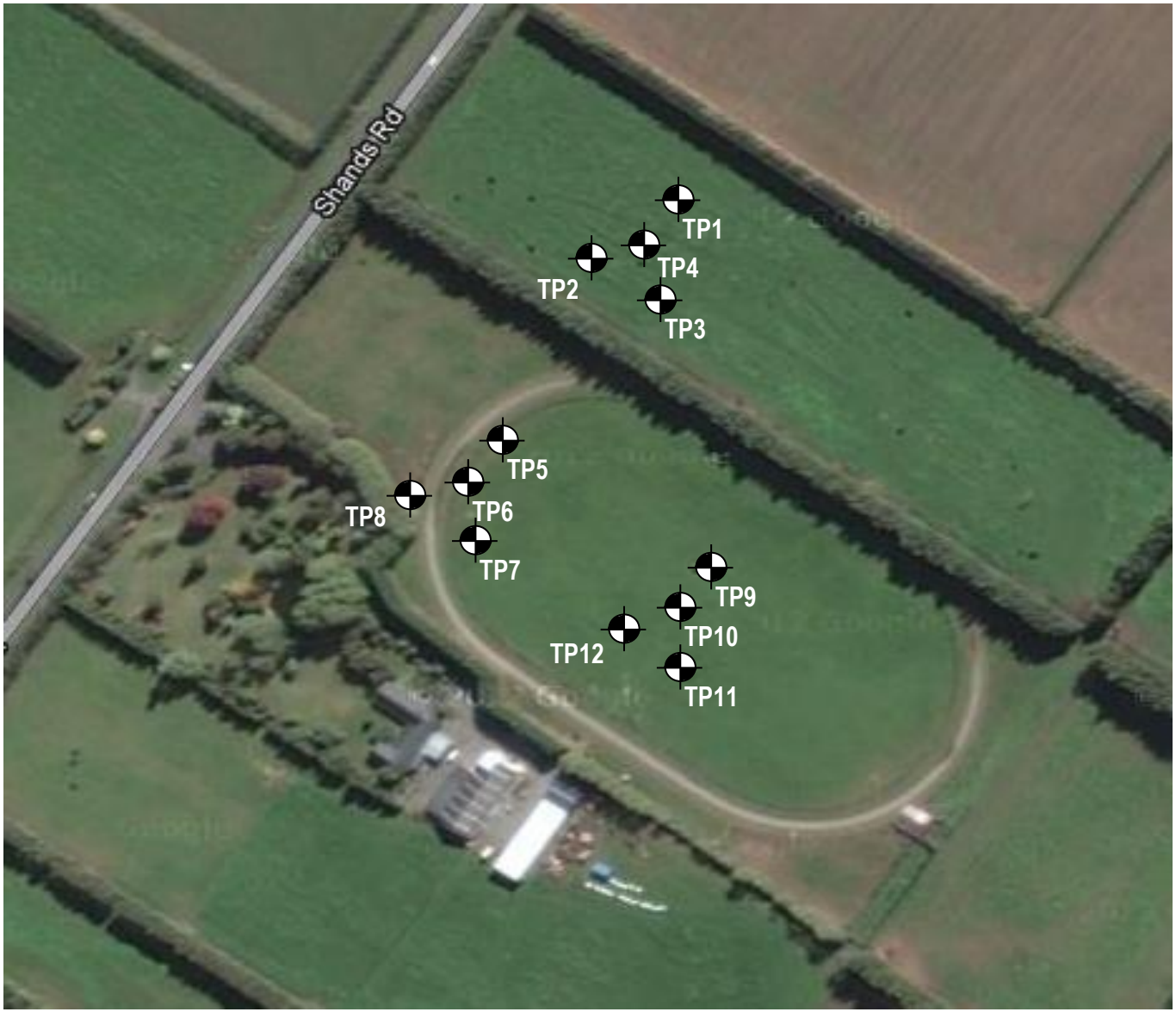
Senior Geotechnical Engineer

MIPENZ, CPEng (Geotechnical)

Date: 16.10.2015

End of Report

APPENDIX A
TEST LOCATION PLANS



Legend:

North

Approximate True North Direction

TP

Approximate Test Pit Locations
Soil & Rock Consultants carried out on 4/5th July 2012

Notes:

1. Soil & Rock Consultants Test Location Plan adapted from aerial photography from Google Maps
2. Locations of features are approximate only

Soil&Rock Consultants
CONSULTING GEOTECHNICAL ENGINEERS

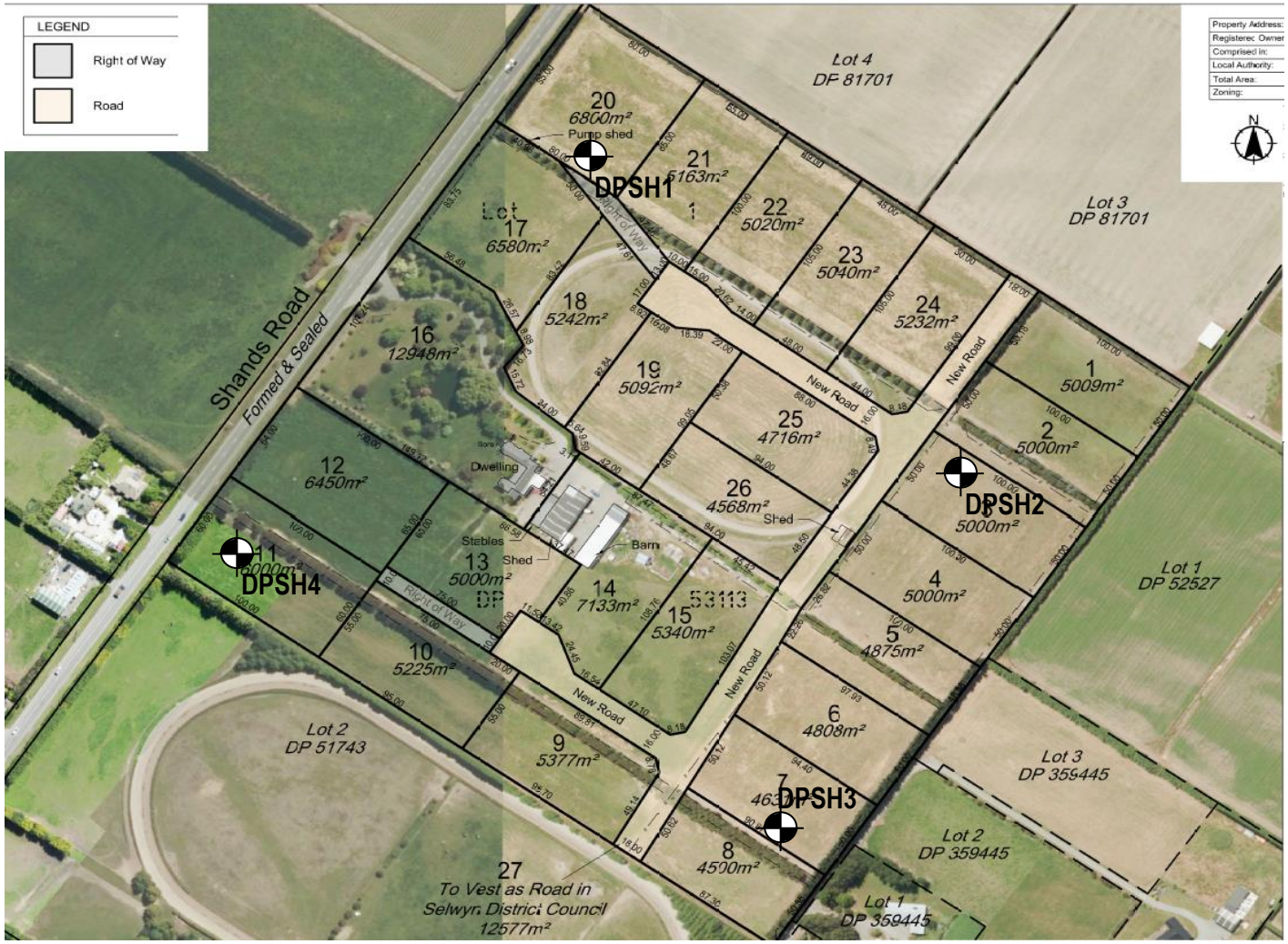
DATE:	July 2012
DRAWN:	EH
SCALE:	NTS
CAD REF:	C12113-1.XLS

TEST LOCATION PLAN
PROPOSED RURAL SUBDIVISION
631 SHANDS ROAD, PREBBLETON

DRAWING NO:

C12113/1

SHEET 1 OF 1



Legend:

North

Approximate True North Direction

DPSH Locations

DPSH

Notes:

1. Soil & Rock Consultants Test Location Plan adapted from aerial photography from Google Maps
2. Locations of features are approximate only

Soil&Rock Consultants
CONSULTING GEOTECHNICAL ENGINEERS

DATE:	September 2015
DRAWN:	NF
SCALE:	NTS
CAD REF:	C15449

TEST LOCATION PLAN
PROPOSED SUBDIVISION
631 SHANDS ROAD, PREBBLETON

DRAWING NO:

C15449/1

SHEET 1 OF 1

APPENDIX B
TEST PIT LOGS

Soil & Rock Consultants
GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

CLIENT: Michael Stratford

PROJECT: 631 Shands Road, Prebbleton, Canterbury

Test Pit No: TP01

Sheet 1 of 1

Drill Type:	2 Tonne Digger	Project No:	C12113	Logged By:	EH
Drilled By:	PCA Construction Ltd	Coordinates:	2469292 E, 5736977 N		
Date Started:	5/7/12	Ground Elevation:	N/A	Surface Conditions:	Near level, grass
Date Finished:	5/7/12	Water Level:	Groundwater not encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)
Topsoil	0.0		Dark brown SILT, some fine sand, soft, moist, non plastic, trace rootlets	
Alluvial Deposits	0.5		Light greyish brown, fine sandy SILT, trace clay, firm to stiff, moist, slightly plastic	
	1.0		Greyish brown, fine to coarse sandy GRAVEL (fine to coarse, subrounded), trace cobbles, dense to very dense, moist	
	1.5			
	2.0		END OF BORE. 2.00 METRES. [Target Depth]	
	2.5			
	3.0			
	3.5			
	4.0			
	4.5			
	5.0			

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2

(Blows per 100mm Increment)

DEPTH (m)	Blows per 100mm Increment
0.0	1
0.1	1
0.2	1
0.3	2
0.4	3
0.5	5
0.6	4
0.7	4
0.8	3
0.9	9
1.0	20

LABORATORY TESTS

HAND AUGER WITH SCALA CHCH LOG C12113 TP1-12 5-7-12.GPJ CHCH S&R_MAY 2012.GDT 11/7/12

Soil & Rock Consultants
GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

CLIENT: Michael Stratford

PROJECT: 631 Shands Road, Prebbleton, Canterbury

Test Pit No: TP02

Sheet 1 of 1

Drill Type:	2 Tonne Digger	Project No:	C12113	Logged By:	EH
Drilled By:	PCA Construction Ltd	Coordinates:	2469266 E, 5736952 N		
Date Started:	4/7/12	Ground Elevation:	N/A	Surface Conditions:	Near level, grass
Date Finished:	4/7/12	Water Level:	Groundwater not encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)
Topsoil	0.0		Dark brown SILT, some fine sand, soft, moist, non plastic	
Alluvial Deposits	0.5		Yellowish brown with grey bands and orange mottles, fine sandy SILT, trace clay, soft to firm, moist, slightly plastic	
	1.0			
	1.5		Greyish brown with orange mottles, fine to coarse sandy GRAVEL (fine to coarse, subrounded), trace cobbles, dense to very dense, moist	
	2.0			
	2.5		END OF BORE. 2.10 METRES. [Target Depth]	
	3.0			
	3.5			
	4.0			
	4.5			
	5.0			

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2

(Blows per 100mm Increment)

DEPTH (m)	Blows per 100mm Increment
0.0	
0.5	0.5, 1.5, 2, 2, 4, 5, 5, 5, 5, 5, 5
1.0	
1.5	25, 21, 24, 20
2.0	
2.5	
3.0	
3.5	
4.0	
4.5	
5.0	

LABORATORY TESTS

HAND AUGER WITH SCALA CHCH LOG C12113 TP1-12 5-7-12.GPJ CHCH S&R_MAY 2012.GDT 11/7/12

PO Box 10212, Phillipstown, Christchurch, 8145. Phone: (03)365 9919
www.soilandrock.co.nz

Soil & Rock Consultants
GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

CLIENT: Michael Stratford

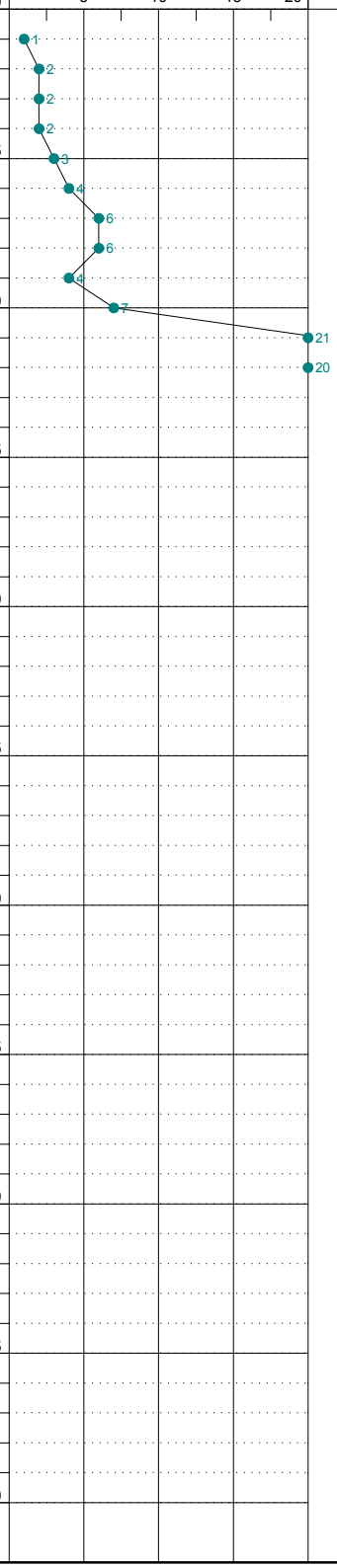
PROJECT: 631 Shands Road, Prebbleton, Canterbury

Test Pit No: TP03

Sheet 1 of 1

Drill Type:	2 Tonne Digger	Project No:	C12113	Logged By:	EH
Drilled By:	PCA Construction Ltd	Coordinates:	2469283 E, 5736937 N		
Date Started:	5/7/12	Ground Elevation:	N/A	Surface Conditions:	Near level, grass
Date Finished:	5/7/12	Water Level:	Groundwater not encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)
Topsoil	0.0		Dark brown SILT, some fine sand, soft, moist, non plastic, minor rootlets	
Alluvial Deposits	0.5		Yellowish brown with orange mottles, fine sandy SILT, trace clay, firm to stiff, moist, slightly plastic	
	1.0		Yellowish brown, silty GRAVEL (fine to coarse, subrounded), minor fine to coarse sand, dense to very dense, moist	
	1.5		Greyish brown, fine to coarse sandy GRAVEL (fine to coarse, subrounded), trace cobbles, dense to very dense, moist	
	2.0		END OF BORE. 2.00 METRES. [Target Depth]	
	2.5			
	3.0			
	3.5			
	4.0			
	4.5			
	5.0			



LABORATORY TESTS

HAND AUGER WITH SCALA CHCH LOG C12113 TP1-12 5-7-12.GPJ CHCH S&R_MAY 2012.GDT 11/7/12

PO Box 10212, Phillipstown, Christchurch, 8145. Phone: (03)365 9919
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GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

CLIENT: Michael Stratford

PROJECT: 631 Shands Road, Prebbleton, Canterbury

Test Pit No: TP04

Sheet 1 of 1

Drill Type:	2 Tonne Digger	Project No:	C12113	Logged By:	EH
Drilled By:	PCA Construction Ltd	Coordinates:	2469283 E, 5736956 N		
Date Started:	4/7/12	Ground Elevation:	N/A	Surface Conditions:	Near level, grass
Date Finished:	4/7/12	Water Level:	Groundwater not encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"
TS	0.0		Dark brown SILT, some fine sand, soft, moist, non plastic, trace rootlets
Alluvial Deposits	0.5		Yellowish brown, fine sandy SILT, trace clay, soft to firm, moist, slightly plastic
			Yellowish brown, fine to medium subrounded gravelly SILT, minor fine to coarse sand, dense, non plastic
	1.0		Greyish brown, fine to coarse sandy GRAVEL (fine to coarse, subrounded), trace cobbles, dense to very dense, moist
	1.5		
	2.0		END OF BORE. 2.00 METRES. [Target Depth]
	2.5		
	3.0		
	3.5		
	4.0		
	4.5		
	5.0		

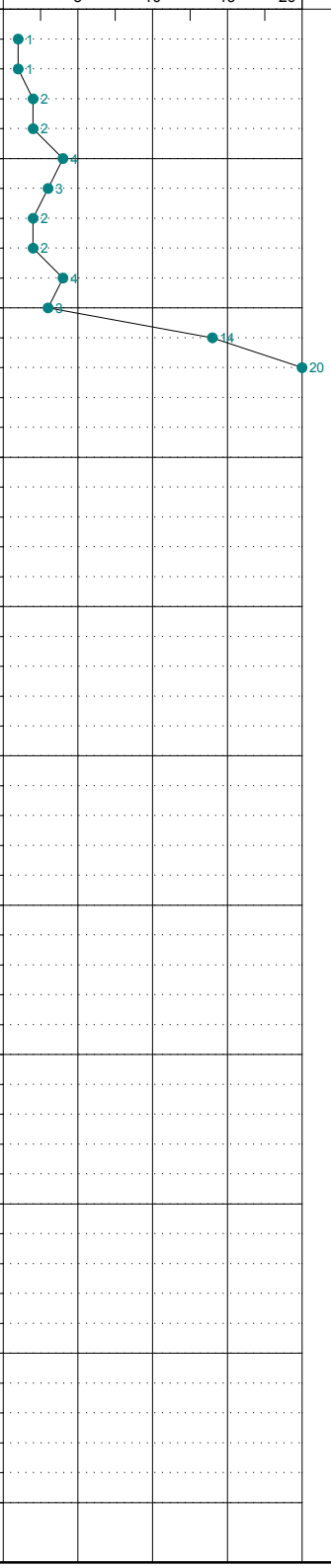
WATER LEVEL (m)

DEPTH (m)

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2

(Blows per 100mm Increment)

5 10 15 20



LABORATORY TESTS

HAND AUGER WITH SCALA CHCH LOG C12113 TP1-12 5-7-12.GPJ CHCH S&R_MAY 2012.GDT 11/7/12

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CLIENT: Michael Stratford

PROJECT: 631 Shands Road, Prebbleton, Canterbury

Test Pit No: TP05

Sheet 1 of 1

Drill Type:	2 Tonne Digger	Project No:	C12113	Logged By:	EH
Drilled By:	PCA Construction Ltd	Coordinates:	2469238 E, 5736884 N		
Date Started:	4/7/12	Ground Elevation:	N/A	Surface Conditions:	Near level, grass
Date Finished:	4/7/12	Water Level:	Groundwater not encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"
TS	0.0		Dark brown SILT, some fine sand, soft, moist, non plastic, minor rootlets
Alluvial Deposits	0.5		Yellowish brown, fine sandy SILT, trace clay, soft to firm, moist, slightly plastic
	1.0		Greyish brown, fine to coarse sandy GRAVEL (fine to coarse, subrounded), trace cobbles, dense to very dense, moist
	1.5		
	2.0		
	2.5		END OF BORE. 2.10 METRES. [Target Depth]
	3.0		
	3.5		
	4.0		
	4.5		
	5.0		

WATER LEVEL (m)

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2

(Blows per 100mm Increment)

DEPTH (m)	Blows per 100mm
0.0	1
0.5	1, 2, 3, 3, 3, 3
1.0	25, 39
1.5	
2.0	
2.5	
3.0	
3.5	
4.0	
4.5	
5.0	

LABORATORY TESTS

HAND AUGER WITH SCALA CHCH LOG C12113 TP1-12 5-7-12.GPJ CHCH S&R_MAY 2012.GDT 11/7/12

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CLIENT: Michael Stratford

PROJECT: 631 Shands Road, Prebbleton, Canterbury

Test Pit No: TP06

Sheet 1 of 1

Drill Type:	2 Tonne Digger	Project No:	C12113	Logged By:	EH
Drilled By:	PCA Construction Ltd	Coordinates:	2469224 E, 5736860 N		
Date Started:	4/7/12	Ground Elevation:	N/A	Surface Conditions:	Near level, grass
Date Finished:	4/7/12	Water Level:	Groundwater not encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)
Topsoil	0.0		Dark brown SILT, some fine sand, soft, moist, non plastic, minor rootlets	
Alluvial Deposits	0.5		Yellowish brown, fine sandy SILT, trace clay, firm to stiff, moist, slightly plastic	
	1.0			
	1.5		Greyish brown, fine to coarse sandy GRAVEL (fine to coarse, subrounded), trace cobbles, dense to very dense, moist	
	2.0			
	2.5		END OF BORE. 2.20 METRES. [Target Depth]	
	3.0			
	3.5			
	4.0			
	4.5			
	5.0			

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2

(Blows per 100mm Increment)

DEPTH (m)	5	10	15	20
0.0	1			
	2			
	3			
0.5	2			
	4			
	5			
	5			
	5			
1.0	6			
	12			
1.5	34			
	36			
2.0	38			

LABORATORY TESTS

HAND AUGER WITH SCALA CHCH LOG C12113 TP1-12 5-7-12.GPJ CHCH S&R_MAY 2012.GDT 11/7/12

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CLIENT: Michael Stratford

PROJECT: 631 Shands Road, Prebbleton, Canterbury

Test Pit No: TP07

Sheet 1 of 1

Drill Type:	2 Tonne Digger	Project No:	C12113	Logged By:	EH
Drilled By:	PCA Construction Ltd	Coordinates:	2469228 E, 5736842 N		
Date Started:	4/7/12	Ground Elevation:	N/A	Surface Conditions:	Near level, grass
Date Finished:	4/7/12	Water Level:	Groundwater not encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"
TS	0.0		Dark brown SILT, some fine sand, soft, moist, non plastic, minor rootlets
Alluvial Deposits	0.5		Yellowish brown, fine sandy SILT, trace clay, soft to firm, moist, slightly plastic
	1.0		Greyish brown, fine to coarse sandy GRAVEL (fine to coarse, subrounded), trace cobbles, dense to very dense, moist
	1.5		
	2.0		END OF BORE. 2.00 METRES. [Target Depth]
	2.5		
	3.0		
	3.5		
	4.0		
	4.5		
	5.0		

WATER LEVEL (m)

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2

(Blows per 100mm Increment)

DEPTH (m)	5	10	15	20
0.0				
0.5	1, 1, 1, 1, 2			
1.0	3	7	12	34
1.5				
2.0				
2.5				
3.0				
3.5				
4.0				
4.5				
5.0				

LABORATORY TESTS

HAND AUGER WITH SCALA CHCH LOG C12113 TP1-12 5-7-12.GPJ CHCH S&R_MAY 2012.GDT 11/7/12

Soil & Rock Consultants
GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

CLIENT: Michael Stratford

PROJECT: 631 Shands Road, Prebbleton, Canterbury

Test Pit No: TP08

Sheet 1 of 1

Drill Type:	2 Tonne Digger	Project No:	C12113	Logged By:	EH
Drilled By:	PCA Construction Ltd	Coordinates:	2469203 E, 5736861 N		
Date Started:	4/7/12	Ground Elevation:	N/A	Surface Conditions:	Near level, grass
Date Finished:	4/7/12	Water Level:	Groundwater not encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"
TS	0.0		Dark brown SILT, some fine sand, soft, dry, non plastic, trace rootlets
Alluvial Deposits	0.5		Yellowish brown, fine sandy SILT, trace clay, firm to stiff, dry, slightly plastic
	1.0		Greyish brown, fine to coarse sandy GRAVEL (fine to coarse, subrounded), trace cobbles, dense to very dense, dry, some rootlets
	1.5		
	2.0		END OF BORE. 1.80 METRES. [Target Depth]
	2.5		
	3.0		
	3.5		
	4.0		
	4.5		
	5.0		

WATER LEVEL (m)

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2

(Blows per 100mm Increment)

DEPTH (m)	5	10	15	20
0.0	2			
	3			
	5			
0.5	5			
	9			
	7			
	10			
	34			
1.0	17			
	7			
	9			
	32			
1.5				
2.0				
2.5				
3.0				
3.5				
4.0				
4.5				
5.0				

LABORATORY TESTS

HAND AUGER WITH SCALA CHCH LOG C12113 TP1-12 5-7-12.GPJ CHCH S&R_MAY 2012.GDT 11/7/12

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CLIENT: Michael Stratford

PROJECT: 631 Shands Road, Prebbleton, Canterbury

Test Pit No: TP09

Sheet 1 of 1

Drill Type:	2 Tonne Digger	Project No:	C12113	Logged By:	EH
Drilled By:	PCA Construction Ltd	Coordinates:	2469322 E, 5736822 N		
Date Started:	4/7/12	Ground Elevation:	N/A	Surface Conditions:	Near level, grass
Date Finished:	4/7/12	Water Level:	Groundwater not encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)
TS	0.0		Dark brown SILT, some fine sand, soft, moist, non plastic, trace rootlets	
Alluvial Deposits	0.5		Yellowish brown, fine sandy SILT, trace clay, soft to firm, moist, slightly plastic	
	1.0		Greyish brown, fine to coarse sandy GRAVEL (fine to coarse, subrounded), trace cobbles, very dense, moist	
	2.0		END OF BORE. 2.00 METRES. [Target Depth]	
	2.5			
	3.0			
	3.5			
	4.0			
	4.5			
	5.0			

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2

(Blows per 100mm Increment)

DEPTH (m)	5	10	15	20
0.0	1			
	1			
	2			
	3			
0.5	5			
	5			
				22
1.0				40
1.5				
2.0				
2.5				
3.0				
3.5				
4.0				
4.5				
5.0				

LABORATORY TESTS

HAND AUGER WITH SCALA CHCH LOG C12113 TP1-12 5-7-12.GPJ CHCH S&R_MAY 2012.GDT 11/7/12

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CLIENT: Michael Stratford

PROJECT: 631 Shands Road, Prebbleton, Canterbury

Test Pit No: TP10

Sheet 1 of 1

Drill Type:	2 Tonne Digger	Project No:	C12113	Logged By:	EH
Drilled By:	PCA Construction Ltd	Coordinates:	2469311 E, 5736806 N		
Date Started:	4/7/12	Ground Elevation:	N/A	Surface Conditions:	Near level, grass
Date Finished:	4/7/12	Water Level:	Groundwater not encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"
TS	0.0		Dark brown SILT, some fine sand, soft, moist, non plastic, trace rootlets
Alluvial Deposits	0.5		Yellowish brown, fine sandy SILT, trace clay, soft to firm, moist, slightly plastic
	1.0		Greyish brown, fine to coarse sandy GRAVEL (fine to coarse, subrounded), minor cobbles, very dense, moist
	1.5		
	2.0		
	2.5		END OF BORE. 2.10 METRES. [Target Depth]
	3.0		
	3.5		
	4.0		
	4.5		
	5.0		

WATER LEVEL (m)

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2

(Blows per 100mm Increment)

DEPTH (m)	5	10	15	20
0.0	1			
	2			
	3			
	2			
0.5	2			
	2			
	2			
	5			
	6			
1.0				22
				23
				20
1.5				
2.0				
2.5				
3.0				
3.5				
4.0				
4.5				
5.0				

LABORATORY TESTS

HAND AUGER WITH SCALA CHCH LOG C12113 TP1-12 5-7-12.GPJ CHCH S&R_MAY 2012.GDT 11/7/12

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CLIENT: Michael Stratford

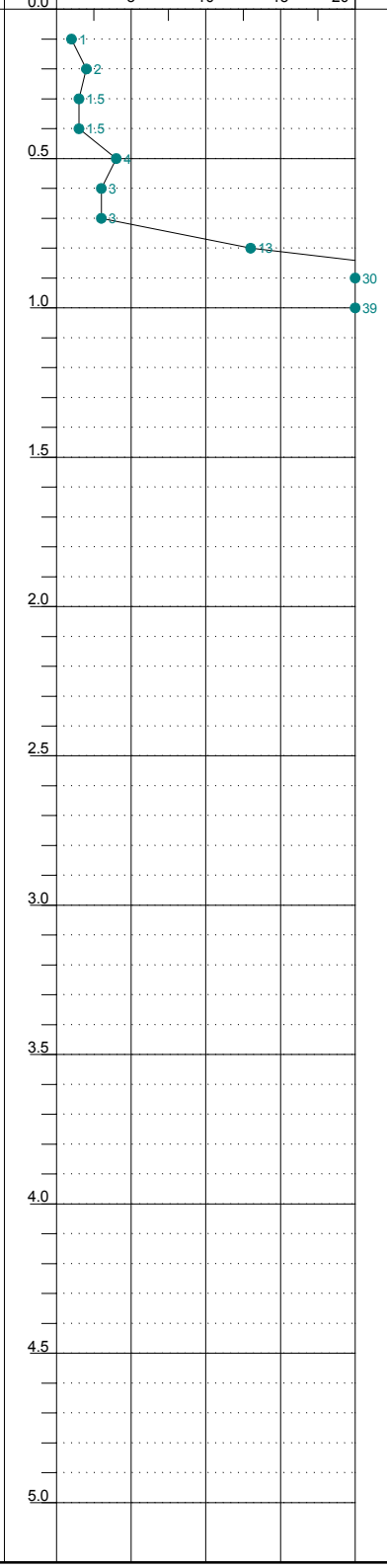
PROJECT: 631 Shands Road, Prebbleton, Canterbury

Test Pit No: TP11

Sheet 1 of 1

Drill Type:	2 Tonne Digger	Project No:	C12113	Logged By:	EH
Drilled By:	PCA Construction Ltd	Coordinates:	2469308 E, 5736785 N		
Date Started:	4/7/12	Ground Elevation:	N/A	Surface Conditions:	Near level, grass
Date Finished:	4/7/12	Water Level:	Groundwater not encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)
TS	0.0		Dark brown SILT, some fine sand, soft, moist, non plastic, trace rootlets	
Alluvial Deposits	0.5		Yellowish brown, fine sandy SILT, trace clay, soft, moist, slightly plastic	
	1.0		Brown, fine to coarse sandy GRAVEL (fine to coarse, subrounded), minor cobbles, very dense, moist	
	1.5		Brown, silty SAND (fine to coarse, loose to medium dense, moist	
	2.0		END OF BORE. 2.00 METRES. [Target Depth]	
	2.5			
	3.0			
	3.5			
	4.0			
	4.5			
	5.0			



LABORATORY TESTS

HAND AUGER WITH SCALA CHCH LOG C12113 TP1-12 5-7-12.GPJ CHCH S&R_MAY 2012.GDT 11/7/12

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CLIENT: Michael Stratford

PROJECT: 631 Shands Road, Prebbleton, Canterbury

Test Pit No: TP12

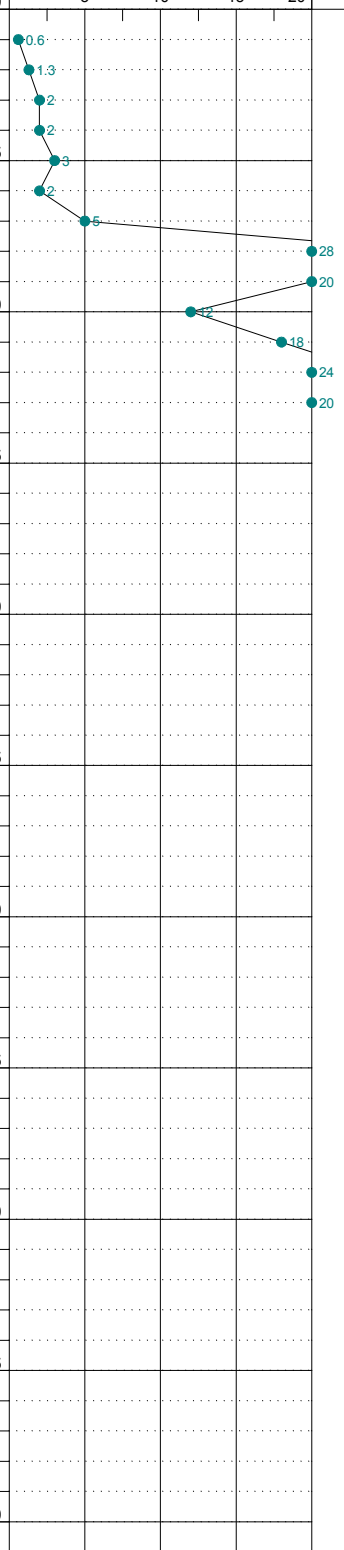
Sheet 1 of 1

Drill Type:	2 Tonne Digger	Project No:	C12113	Logged By:	EH
Drilled By:	PCA Construction Ltd	Coordinates:	2469294 E, 5736802 N		
Date Started:	4/7/12	Ground Elevation:	N/A	Surface Conditions:	Near level, grass
Date Finished:	4/7/12	Water Level:	Groundwater not encountered		

STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG	Soil description in accordance with the NZ Geotechnical Society Inc 2005 "Guidelines for Field Description of Soil and Rock in Engineering Use"	WATER LEVEL (m)
TS	0.0		Dark brown SILT, some fine sand, soft, moist, non plastic, trace rootlets	
Alluvial Deposits	0.5		Yellowish brown, fine sandy SILT, trace clay, soft, moist, slightly plastic	
	1.0		Greyish brown, fine to coarse sandy GRAVEL (fine to coarse, subrounded), minor cobbles, dense to very dense, moist	
	1.5			
	2.0		END OF BORE. 2.00 METRES. [Target Depth]	
	2.5			
	3.0			
	3.5			
	4.0			
	4.5			
	5.0			

SCALA PENETROMETER TEST METHOD NZS4402: 1986 test 6.5.2

(Blows per 100mm Increment)



LABORATORY TESTS

HAND AUGER WITH SCALA CHCH LOG C12113 TP1-12 5-7-12.GPJ CHCH S&R_MAY 2012.GDT 11/7/12

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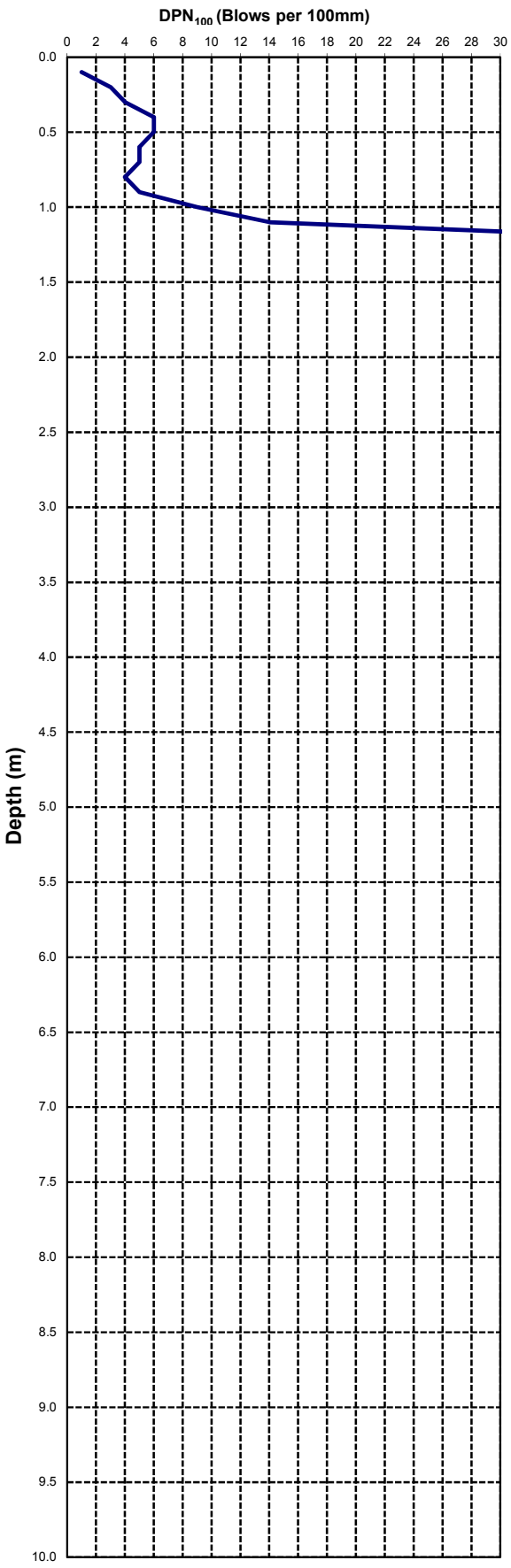
APPENDIX C
DPSH DATA

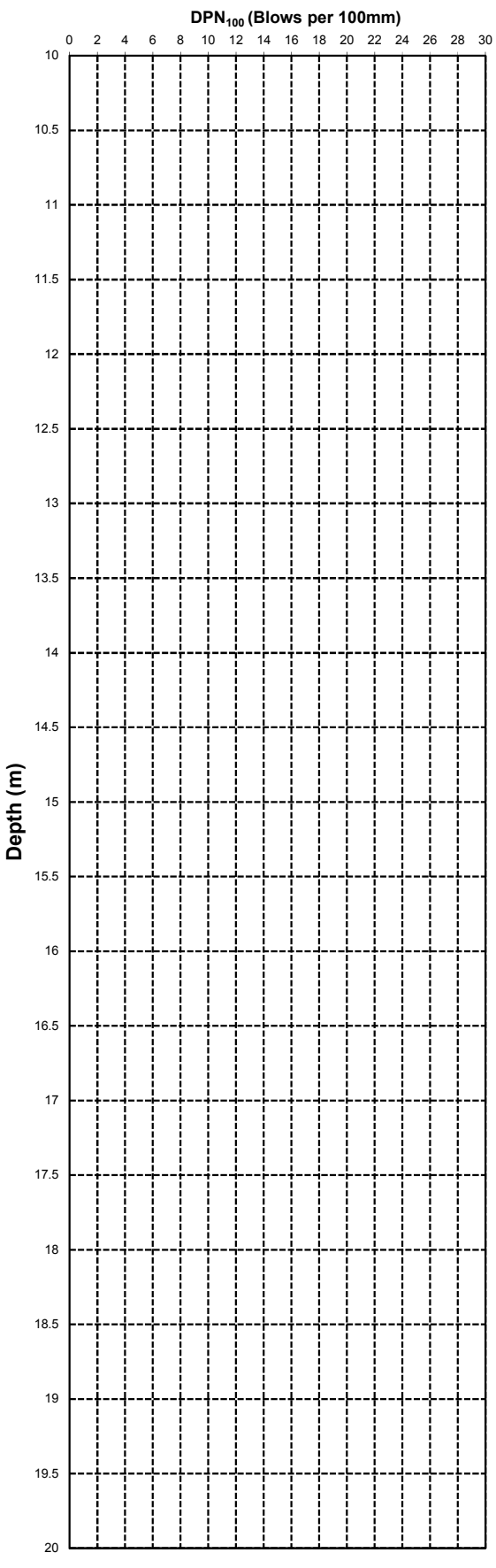
DYNAMIC PROBE TEST

No. DPSH-01

Test Location:	Test Carried out By:	Ground Investigation	GI Ref.: 15-195
N:	Logged By:	PH	Project: 631 Shands Road, Prebbleton
E:	Checked By:	BE	Location: -43.57396,172.49550
Elevation:	Date of Test:	23/09/2015	Client: Soil & Rock
Datum:	Test Type:	DPSH	Client Ref.: Nick

Depth (m)	DPN_{100}	Depth (m)	DPN_{100}
0.1	1	10.1	
0.2	3	10.2	
0.3	4	10.3	
0.4	6	10.4	
0.5	6	10.5	
0.6	5	10.6	
0.7	5	10.7	
0.8	4	10.8	
0.9	5	10.9	
1.0	9	11.0	
1.1	14	11.1	
1.2	40	11.2	
1.3		11.3	
1.4		11.4	
1.5		11.5	
1.6		11.6	
1.7		11.7	
1.8		11.8	
1.9		11.9	
2.0		12.0	
2.1		12.1	
2.2		12.2	
2.3		12.3	
2.4		12.4	
2.5		12.5	
2.6		12.6	
2.7		12.7	
2.8		12.8	
2.9		12.9	
3.0		13.0	
3.1		13.1	
3.2		13.2	
3.3		13.3	
3.4		13.4	
3.5		13.5	
3.6		13.6	
3.7		13.7	
3.8		13.8	
3.9		13.9	
4.0		14.0	
4.1		14.1	
4.2		14.2	
4.3		14.3	
4.4		14.4	
4.5		14.5	
4.6		14.6	
4.7		14.7	
4.8		14.8	
4.9		14.9	
5.0		15.0	
5.1		15.1	
5.2		15.2	
5.3		15.3	
5.4		15.4	
5.5		15.5	
5.6		15.6	
5.7		15.7	
5.8		15.8	
5.9		15.9	
6.0		16.0	
6.1		16.1	
6.2		16.2	
6.3		16.3	
6.4		16.4	
6.5		16.5	
6.6		16.6	
6.7		16.7	
6.8		16.8	
6.9		16.9	
7.0		17.0	
7.1		17.1	
7.2		17.2	
7.3		17.3	
7.4		17.4	
7.5		17.5	
7.6		17.6	
7.7		17.7	
7.8		17.8	
7.9		17.9	
8.0		18.0	
8.1		18.1	
8.2		18.2	
8.3		18.3	
8.4		18.4	
8.5		18.5	
8.6		18.6	
8.7		18.7	
8.8		18.8	
8.9		18.9	
9.0		19.0	
9.1		19.1	
9.2		19.2	
9.3		19.3	
9.4		19.4	
9.5		19.5	
9.6		19.6	
9.7		19.7	
9.8		19.8	
9.9		19.9	
10.0		20.0	





GROUND INVESTIGATION

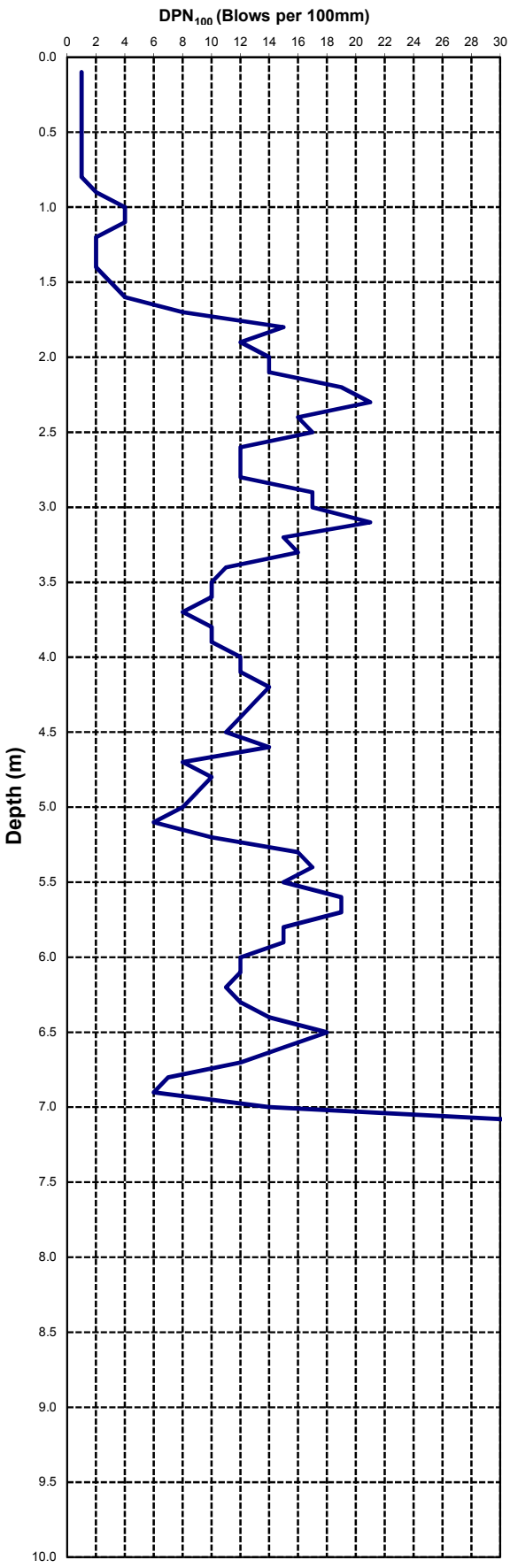
Remarks:

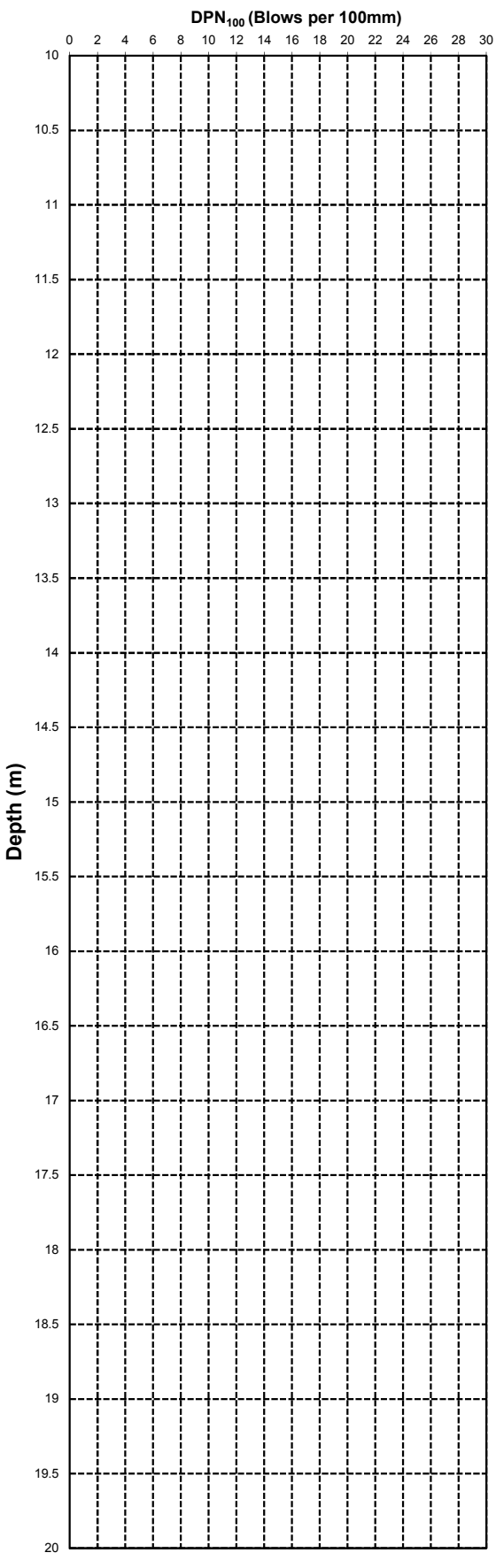
DYNAMIC PROBE TEST

No. DPSH-02

Test Location:	Test Carried out By:	Ground Investigation	GI Ref.: 15-195
N:	Logged By:	PH	Project: 631 Shands Road, Prebbleton
E:	Checked By:	BE	Location: -43.57530,172.49787
Elevation:	Date of Test:	23/09/2015	Client: Soil & Rock
Datum:	Test Type:	DPSH	Client Ref.: Nick

Depth (m)	DPN_{100}	Depth (m)	DPN_{100}
0.1	1	10.1	
0.2	1	10.2	
0.3	1	10.3	
0.4	1	10.4	
0.5	1	10.5	
0.6	1	10.6	
0.7	1	10.7	
0.8	1	10.8	
0.9	2	10.9	
1.0	4	11.0	
1.1	4	11.1	
1.2	2	11.2	
1.3	2	11.3	
1.4	2	11.4	
1.5	3	11.5	
1.6	4	11.6	
1.7	8	11.7	
1.8	15	11.8	
1.9	12	11.9	
2.0	14	12.0	
2.1	14	12.1	
2.2	19	12.2	
2.3	21	12.3	
2.4	16	12.4	
2.5	17	12.5	
2.6	12	12.6	
2.7	12	12.7	
2.8	12	12.8	
2.9	17	12.9	
3.0	17	13.0	
3.1	21	13.1	
3.2	15	13.2	
3.3	16	13.3	
3.4	11	13.4	
3.5	10	13.5	
3.6	10	13.6	
3.7	8	13.7	
3.8	10	13.8	
3.9	10	13.9	
4.0	12	14.0	
4.1	12	14.1	
4.2	14	14.2	
4.3	13	14.3	
4.4	12	14.4	
4.5	11	14.5	
4.6	14	14.6	
4.7	8	14.7	
4.8	10	14.8	
4.9	9	14.9	
5.0	8	15.0	
5.1	6	15.1	
5.2	10	15.2	
5.3	16	15.3	
5.4	17	15.4	
5.5	15	15.5	
5.6	19	15.6	
5.7	19	15.7	
5.8	15	15.8	
5.9	15	15.9	
6.0	12	16.0	
6.1	12	16.1	
6.2	11	16.2	
6.3	12	16.3	
6.4	14	16.4	
6.5	18	16.5	
6.6	15	16.6	
6.7	12	16.7	
6.8	7	16.8	
6.9	6	16.9	
7.0	14	17.0	
7.1	34	17.1	
7.2	40	17.2	
7.3		17.3	
7.4		17.4	
7.5		17.5	
7.6		17.6	
7.7		17.7	
7.8		17.8	
7.9		17.9	
8.0		18.0	
8.1		18.1	
8.2		18.2	
8.3		18.3	
8.4		18.4	
8.5		18.5	
8.6		18.6	
8.7		18.7	
8.8		18.8	
8.9		18.9	
9.0		19.0	
9.1		19.1	
9.2		19.2	
9.3		19.3	
9.4		19.4	
9.5		19.5	
9.6		19.6	
9.7		19.7	
9.8		19.8	
9.9		19.9	
10.0		20.0	





GROUND INVESTIGATION

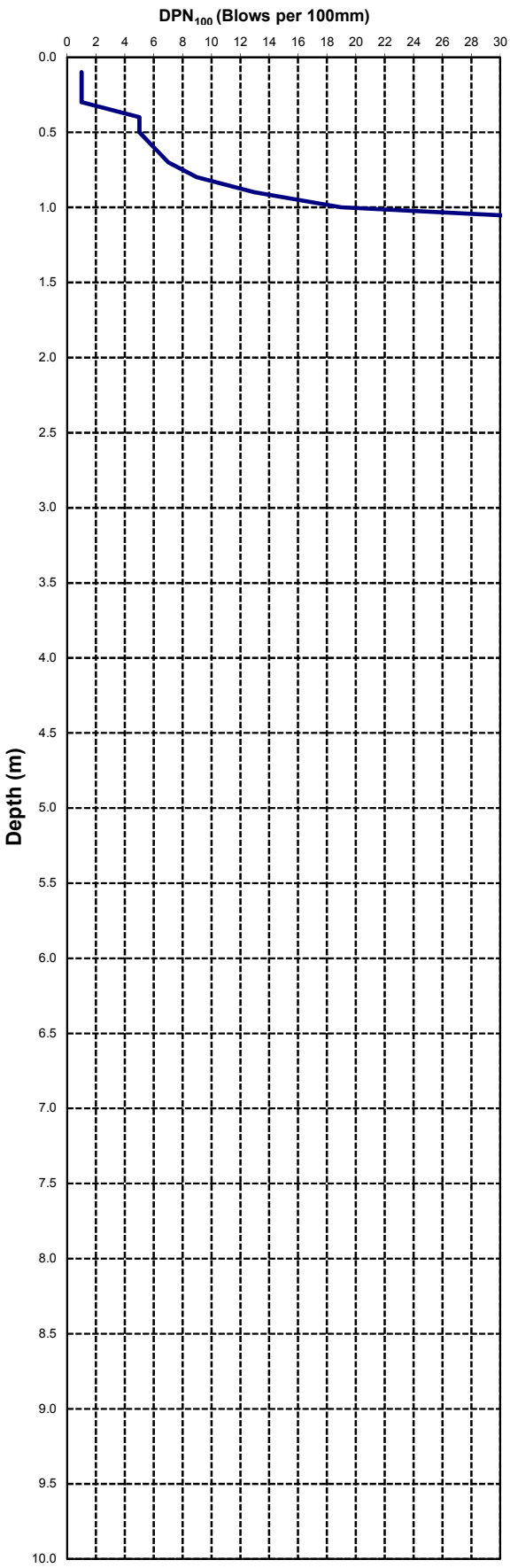
Remarks:

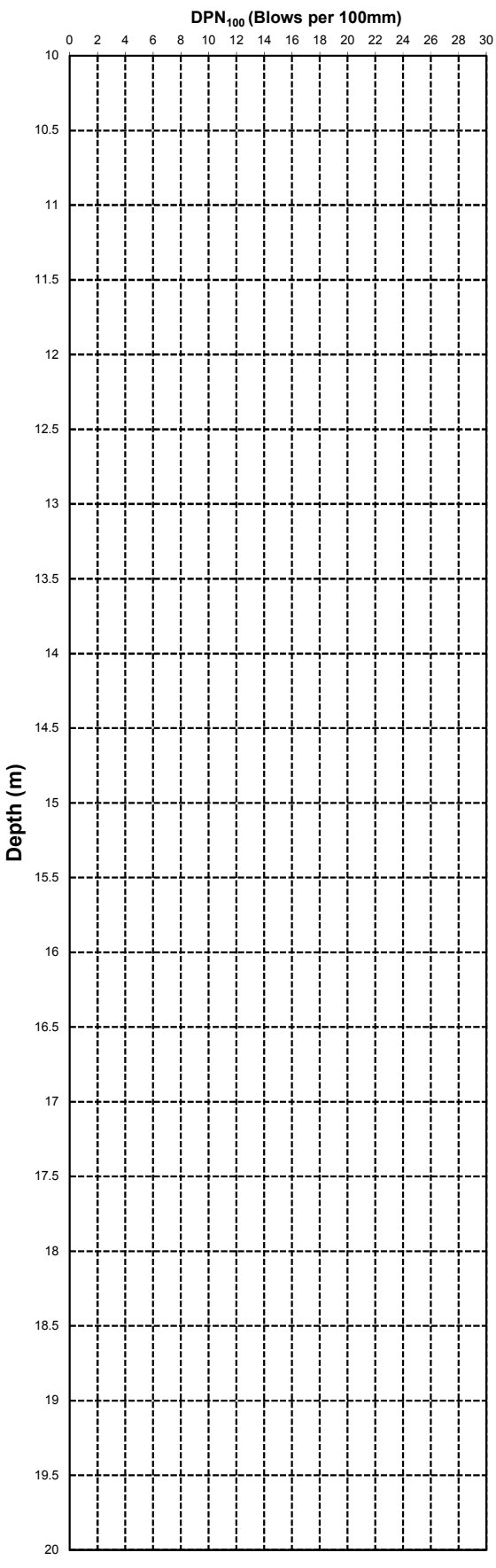
DYNAMIC PROBE TEST

No. DPSH-03

Test Location:	Test Carried out By:	Ground Investigation	GI Ref.: 15-195
N:	Logged By:	PH	Project: 631 Shands Road, Prebbleton
E:	Checked By:	BE	Location: -43.57775,172.49650
Elevation:	Date of Test:	23/09/2015	Client: Soil & Rock
Datum:	Test Type:	DPSH	Client Ref.: Nick

Depth (m)	DPN_{100}	Depth (m)	DPN_{100}
0.1	1	10.1	
0.2	1	10.2	
0.3	1	10.3	
0.4	5	10.4	
0.5	5	10.5	
0.6	6	10.6	
0.7	7	10.7	
0.8	9	10.8	
0.9	13	10.9	
1.0	19	11.0	
1.1	40	11.1	
1.2		11.2	
1.3		11.3	
1.4		11.4	
1.5		11.5	
1.6		11.6	
1.7		11.7	
1.8		11.8	
1.9		11.9	
2.0		12.0	
2.1		12.1	
2.2		12.2	
2.3		12.3	
2.4		12.4	
2.5		12.5	
2.6		12.6	
2.7		12.7	
2.8		12.8	
2.9		12.9	
3.0		13.0	
3.1		13.1	
3.2		13.2	
3.3		13.3	
3.4		13.4	
3.5		13.5	
3.6		13.6	
3.7		13.7	
3.8		13.8	
3.9		13.9	
4.0		14.0	
4.1		14.1	
4.2		14.2	
4.3		14.3	
4.4		14.4	
4.5		14.5	
4.6		14.6	
4.7		14.7	
4.8		14.8	
4.9		14.9	
5.0		15.0	
5.1		15.1	
5.2		15.2	
5.3		15.3	
5.4		15.4	
5.5		15.5	
5.6		15.6	
5.7		15.7	
5.8		15.8	
5.9		15.9	
6.0		16.0	
6.1		16.1	
6.2		16.2	
6.3		16.3	
6.4		16.4	
6.5		16.5	
6.6		16.6	
6.7		16.7	
6.8		16.8	
6.9		16.9	
7.0		17.0	
7.1		17.1	
7.2		17.2	
7.3		17.3	
7.4		17.4	
7.5		17.5	
7.6		17.6	
7.7		17.7	
7.8		17.8	
7.9		17.9	
8.0		18.0	
8.1		18.1	
8.2		18.2	
8.3		18.3	
8.4		18.4	
8.5		18.5	
8.6		18.6	
8.7		18.7	
8.8		18.8	
8.9		18.9	
9.0		19.0	
9.1		19.1	
9.2		19.2	
9.3		19.3	
9.4		19.4	
9.5		19.5	
9.6		19.6	
9.7		19.7	
9.8		19.8	
9.9		19.9	
10.0		20.0	





GROUND INVESTIGATION

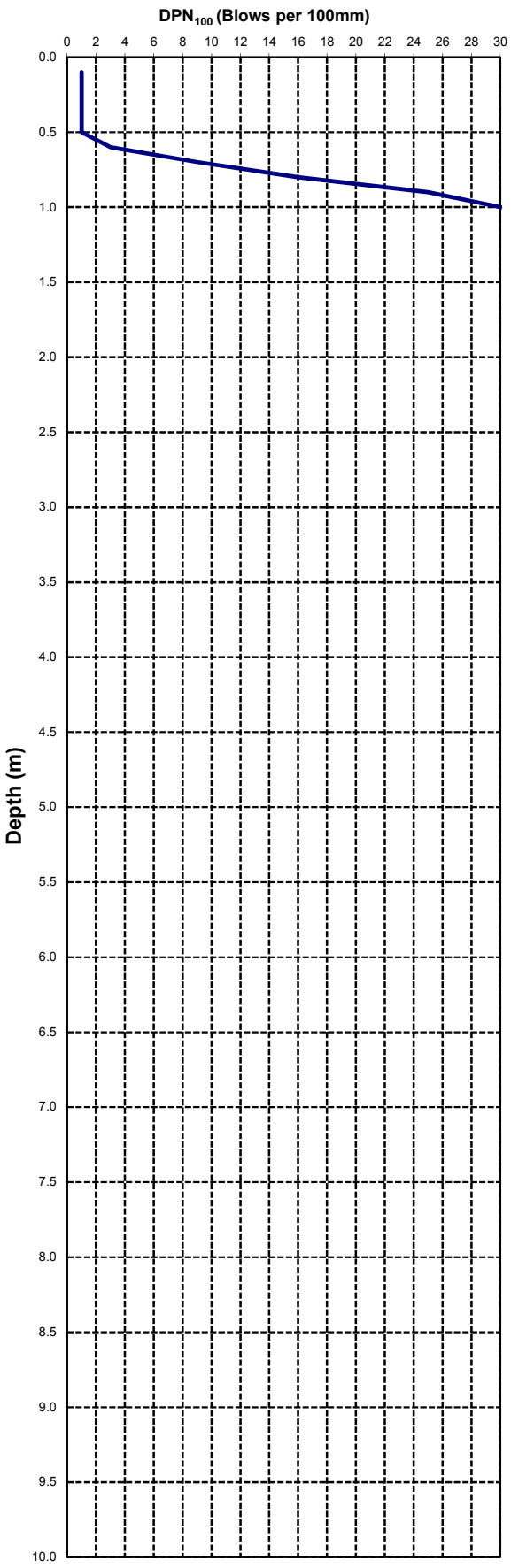
Remarks:

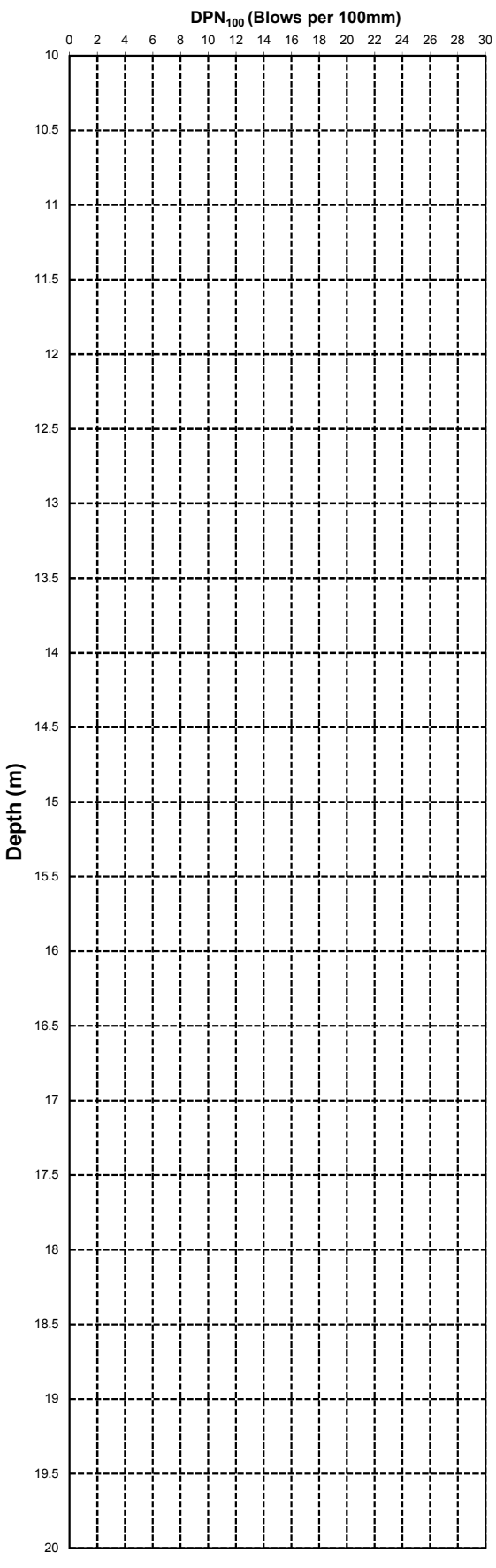
DYNAMIC PROBE TEST

No. DPSH-04

Test Location:	Test Carried out By:	Ground Investigation	GI Ref.: 15-195
N:	Logged By:	PH	Project: 631 Shands Road, Prebbleton
E:	Checked By:	BE	Location: -43.57576,172.49297
Elevation:	Date of Test:	23/09/2015	Client: Soil & Rock
Datum:	Test Type:	DPSH	Client Ref.: Nick

Depth (m)	DPN_{100}	Depth (m)	DPN_{100}
0.1	1	10.1	
0.2	1	10.2	
0.3	1	10.3	
0.4	1	10.4	
0.5	1	10.5	
0.6	3	10.6	
0.7	9	10.7	
0.8	16	10.8	
0.9	25	10.9	
1.0	30	11.0	
1.1	40	11.1	
1.2		11.2	
1.3		11.3	
1.4		11.4	
1.5		11.5	
1.6		11.6	
1.7		11.7	
1.8		11.8	
1.9		11.9	
2.0		12.0	
2.1		12.1	
2.2		12.2	
2.3		12.3	
2.4		12.4	
2.5		12.5	
2.6		12.6	
2.7		12.7	
2.8		12.8	
2.9		12.9	
3.0		13.0	
3.1		13.1	
3.2		13.2	
3.3		13.3	
3.4		13.4	
3.5		13.5	
3.6		13.6	
3.7		13.7	
3.8		13.8	
3.9		13.9	
4.0		14.0	
4.1		14.1	
4.2		14.2	
4.3		14.3	
4.4		14.4	
4.5		14.5	
4.6		14.6	
4.7		14.7	
4.8		14.8	
4.9		14.9	
5.0		15.0	
5.1		15.1	
5.2		15.2	
5.3		15.3	
5.4		15.4	
5.5		15.5	
5.6		15.6	
5.7		15.7	
5.8		15.8	
5.9		15.9	
6.0		16.0	
6.1		16.1	
6.2		16.2	
6.3		16.3	
6.4		16.4	
6.5		16.5	
6.6		16.6	
6.7		16.7	
6.8		16.8	
6.9		16.9	
7.0		17.0	
7.1		17.1	
7.2		17.2	
7.3		17.3	
7.4		17.4	
7.5		17.5	
7.6		17.6	
7.7		17.7	
7.8		17.8	
7.9		17.9	
8.0		18.0	
8.1		18.1	
8.2		18.2	
8.3		18.3	
8.4		18.4	
8.5		18.5	
8.6		18.6	
8.7		18.7	
8.8		18.8	
8.9		18.9	
9.0		19.0	
9.1		19.1	
9.2		19.2	
9.3		19.3	
9.4		19.4	
9.5		19.5	
9.6		19.6	
9.7		19.7	
9.8		19.8	
9.9		19.9	
10.0		20.0	





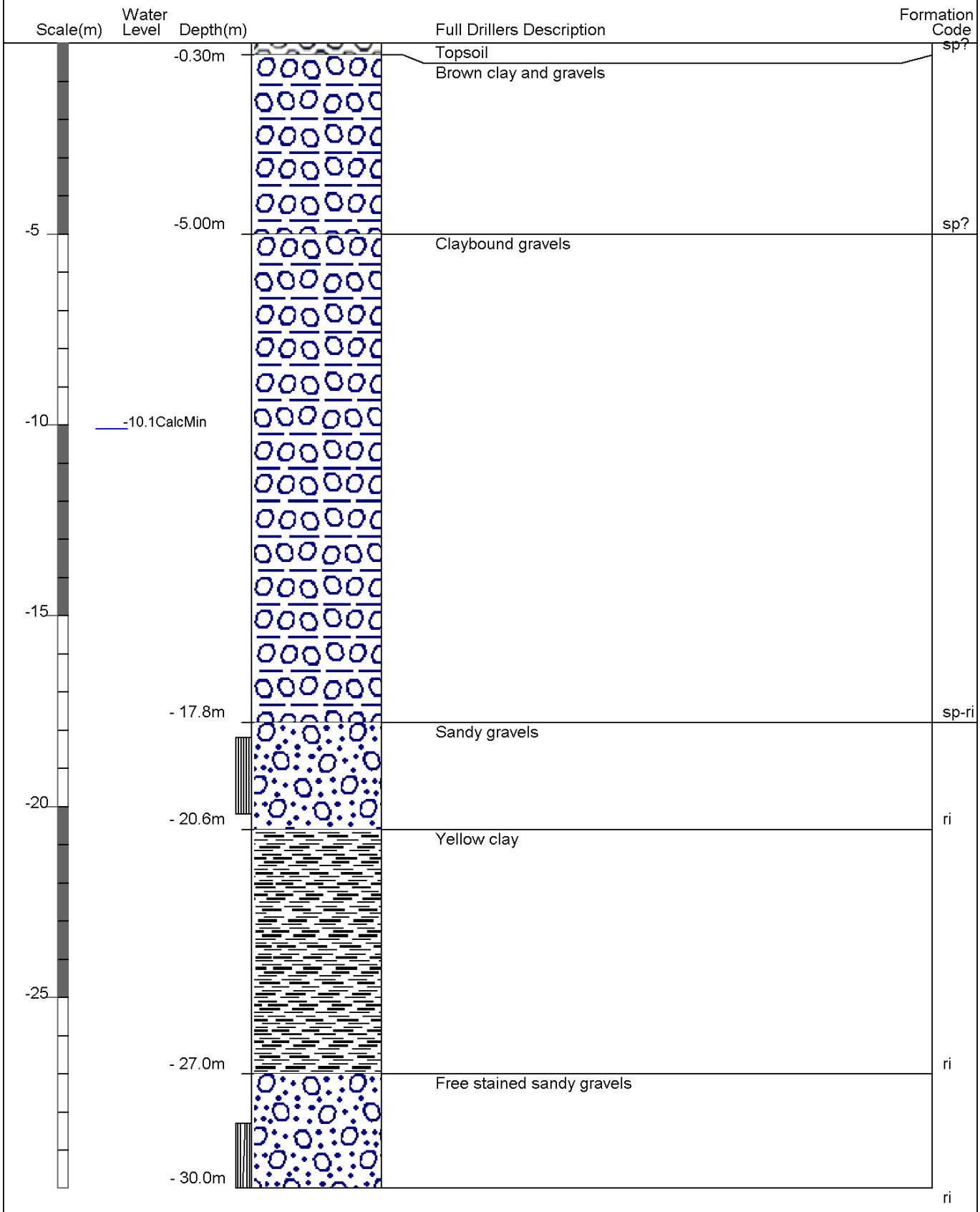
GROUND INVESTIGATION

Remarks:

APPENDIX C
ECAN WELLBORE LOGS

Borelog for well M36/3989

Gridref: M36:6925-3680 Accuracy : 4 (1=best, 4=worst)
Ground Level Altitude : 30 +MSD
Driller : McMillan Water Wells Ltd
Drill Method : Rotary/Percussion
Drill Depth : -30m Drill Date : 11/01/1989



Borelog for well M36/5119

Gridref: M36:70303-37092 Accuracy : 2 (1=best, 4=worst)
Ground Level Altitude : 26 +MSD
Driller : Dynes Road Drilling
Drill Method : Cable Tool
Drill Depth : -30m Drill Date : 1/02/1996